Volume Contents

Number 1. January

ARTICLES

1 **Function of Photosynthetic Apparatus of Intact Wheat Leaves under High Light and Heat Stress and Its Relationship with Peroxidation of Thylakoid Lipids**—Ranjit K. Mishra and Gauri S. Singhal*

7 **Involvement of Singlet Oxygen in 5-Aminolevulinic Acid-Induced Photodynamic Damage of Cucumber (*Cucumis sativus* L.) Chloroplasts**—Niranjan Chakraborty and Baishnab Charan Tripathy*

12 **Purification and Characterization of Cinnamyl Alcohol Dehydrogenase from Tobacco Stems**—Claire Halpin, Mary E. Knight, Jacqueline Grima-Pettenati, Deborah Goffner, Alain M. Boudet, and Wolfgang Schuch*

17 **Selective Inhibition of Active Uptake of Sucrose into Plasma Membrane Vesicles by Polyclonal Sera Directed against a 42 Kilodalton Plasma Membrane Polypeptide**—Olivier Gallet, Rémi Lemoine, Cécile Gaillard, Christer Larsson, and Serge Delrot*

24 **Immunochemical Analysis of the Temporal and Tissue-Specific Expression of an *Avena sativa* Plasma Membrane Determinant**—Michael A. Lynes

34 **Redox Processes in the Blue Light Response of Guard Cell Protoplasts of *Commelina communis* L.**—Hélène Gautier*, Alain Vavasseur, Gérard Lascève, and Alain M. Boudet

39 **Biochemical Characteristics of Thylakoid Membranes in Chloroplasts of Dark-Grown Pine Cotyledons**—Kenji Shinohara*, Akio Murakami, and Yoshihiko Fujita

44 **Inhibition of Tonoplast ATPase by 2′,3′-Dialdehyde Derivative of ATP**—Wing Ming Chow, Chi Meng Tzeng, Chung Shung Chen, Soong Yu Kuo, May Yun Wang, and Rong Long Pan*

53 **Expression of a *Brassica napus* Malate Synthase Gene in Transgenic Tomato Plants during the Transition from Late Embryogeny to Germination**—Lucio Comai, Kelly L. Matsudaira, Rick C. Heupel, Robert A. Dietrich, and John J. Harada*

62 **Fungal Elicitor-Mediated Responses in Pine Cell Cultures. III. Purification and Characterization of Phenylalanine Ammonia-Lyase**—Malcolm M. Campbell and Brian E. Ellis*

71 **Cell Wall Dissolution in Ripening Kiwifruit (*Actinidia deliciosa*). Solubilization of the Pectic Polymers**—Robert J. Redgwell*, Laurence D. Melton, and Donald J. Brasch

82 **Purification and Molecular and Immunological Characterization of a Unique Phosphoribulokinase from the Green Alga *Selenastrum minutum***—Min Lin and David H. Turpin*

89 **Growth Stimulation by Catecholamines in Plant Tissue/Organ Cultures**—Calixto M. Protacio, Yao-ren Dai, Eldrin F. Lewis, and Hector E. Flores*

97 **Effects of Low O_2 Root Stress on Ethylene Biosynthesis in Tomato Plants (*Lycopersicon esculentum* Mill cv Heinz 1350)**—Tzann-Wei Wang and Richard N. Arteca*

101 **Auxin Transport and the Interaction of Phytotropins. Probing the Properties of a Phytotropin Binding Protein**—Sandra A. Brunn, Gloria K. Muday, and Philip Haworth*

108 **Solute Accumulation and Compartmentation during the Cold Acclimation of Puma Rye**—Karen L. Koster* and Daniel V. Lynch

114 **Expression of Foreign Genes in Transgenic Yellow-Poplar Plants**—H. Dayton Wilde*, Richard B. Meagher, and Scott A. Merkle

121 **Covalent Binding Sites of Victorin in Oat Leaf Tissues Detected by Anti-Victorin Polyclonal Antibodies**—Kazuya Akimitsu, L. Patrick Hart*, Jonathan D. Walton, and Rawle Hollingsworth

127 **Heavy Metal-Activated Synthesis of Peptides in *Chlamydomonas reinhardtii***—Gregg Howe and Sabeeha Merchant*

137 **Enhanced Sensitivity to Ethylene in Nitrogen- or Phosphate-Starved Roots of *Zea mays* L. during Aerenchyma Formation**—Chuan-Jiu He, Page W. Morgan, and Malcolm C. Drew*

143 **Nodules Initiated by *Rhizobium meliloti* Exopolysaccharide Mutants Lack a Discrete, Persistent Nodule Meristem**—Cheng Yang, Ethan R. Signer, and Ann M. Hirsch*

152 **Light Activation of Maize Phospho*enol*pyruvate Carboxylase Protein-Serine Kinase Activity Is Inhibited by Mesophyll and Bundle Sheath-Directed Photosynthesis Inhibitors**—Jin-an Jiao and Raymond Chollet*

157 **Differential Protein Accumulation in Banana Fruit during Ripening**—Eva Dominguez-Puigjaner, Miguel Vendrell*, and M. Dolors Ludevid

163 **Complete Amino Acid Sequence of Soybean Leaf P21. Similarity to the Thaumatin-Like Polypeptides**—John S. Graham*, William Burkhart, Jin Xiong, and Jeffrey W. Gillikin

166 **Rejuvenation of *Sequoia sempervirens* by Repeated Grafting of Shoot Tips onto Juvenile Rootstocks *in Vitro*. Model for Phase Reversal of Trees**—Li-Chun Huang, Suwenza Lius, Bau-Lian Huang, Toshio Murashige*, El Fatih M. Mahdi, and Richard Van Gundy

174 **Purification and Partial Characterization of Maize (*Zea mays* L.) β-Glucosidase**—Asim Esen

183 **Sidedness of Plant Plasma Membrane Vesicles Altered**

* Author to whom correspondence should be addressed.

Continued on next page

Volume Contents

Number 1. January

ARTICLES

1 **Function of Photosynthetic Apparatus of Intact Wheat Leaves under High Light and Heat Stress and Its Relationship with Peroxidation of Thylakoid Lipids**—Ranjit K. Mishra and Gauri S. Singhal*

7 **Involvement of Singlet Oxygen in 5-Aminolevulinic Acid-Induced Photodynamic Damage of Cucumber (*Cucumis sativus* L.) Chloroplasts**—Niranjan Chakraborty and Baishnab Charan Tripathy*

12 **Purification and Characterization of Cinnamyl Alcohol Dehydrogenase from Tobacco Stems**—Claire Halpin, Mary E. Knight, Jacqueline Grima-Pettenati, Deborah Goffner, Alain M. Boudet, and Wolfgang Schuch*

17 **Selective Inhibition of Active Uptake of Sucrose into Plasma Membrane Vesicles by Polyclonal Sera Directed against a 42 Kilodalton Plasma Membrane Polypeptide**—Olivier Gallet, Rémi Lemoine, Cécile Gaillard, Christer Larsson, and Serge Delrot*

24 **Immunochemical Analysis of the Temporal and Tissue-Specific Expression of an *Avena sativa* Plasma Membrane Determinant**—Michael A. Lynes

34 **Redox Processes in the Blue Light Response of Guard Cell Protoplasts of *Commelina communis* L.**—Hélène Gautier*, Alain Vavasseur, Gérard Lascève, and Alain M. Boudet

39 **Biochemical Characteristics of Thylakoid Membranes in Chloroplasts of Dark-Grown Pine Cotyledons**—Kenji Shinohara*, Akio Murakami, and Yoshihiko Fujita

44 **Inhibition of Tonoplast ATPase by 2′,3′-Dialdehyde Derivative of ATP**—Wing Ming Chow, Chi Meng Tzeng, Chung Shung Chen, Soong Yu Kuo, May Yun Wang, and Rong Long Pan*

53 **Expression of a *Brassica napus* Malate Synthase Gene in Transgenic Tomato Plants during the Transition from Late Embryogeny to Germination**—Lucio Comai, Kelly L. Matsudaira, Rick C. Heupel, Robert A. Dietrich, and John J. Harada*

62 **Fungal Elicitor-Mediated Responses in Pine Cell Cultures. III. Purification and Characterization of Phenylalanine Ammonia-Lyase**—Malcolm M. Campbell and Brian E. Ellis*

71 **Cell Wall Dissolution in Ripening Kiwifruit (*Actinidia deliciosa*). Solubilization of the Pectic Polymers**—Robert J. Redgwell*, Laurence D. Melton, and Donald J. Brasch

82 **Purification and Molecular and Immunological Characterization of a Unique Phosphoribulokinase from the Green Alga *Selenastrum minutum***—Min Lin and David H. Turpin*

89 **Growth Stimulation by Catecholamines in Plant Tissue/Organ Cultures**—Calixto M. Protacio, Yao-ren Dai, Eldrin F. Lewis, and Hector E. Flores*

97 **Effects of Low O_2 Root Stress on Ethylene Biosynthesis in Tomato Plants (*Lycopersicon esculentum* Mill cv Heinz 1350)**—Tzann-Wei Wang and Richard N. Arteca*

101 **Auxin Transport and the Interaction of Phytotropins. Probing the Properties of a Phytotropin Binding Protein**—Sandra A. Brunn, Gloria K. Muday, and Philip Haworth*

108 **Solute Accumulation and Compartmentation during the Cold Acclimation of Puma Rye**—Karen L. Koster* and Daniel V. Lynch

114 **Expression of Foreign Genes in Transgenic Yellow-Poplar Plants**—H. Dayton Wilde*, Richard B. Meagher, and Scott A. Merkle

121 **Covalent Binding Sites of Victorin in Oat Leaf Tissues Detected by Anti-Victorin Polyclonal Antibodies**—Kazuya Akimitsu, L. Patrick Hart*, Jonathan D. Walton, and Rawle Hollingsworth

127 **Heavy Metal-Activated Synthesis of Peptides in *Chlamydomonas reinhardtii***—Gregg Howe and Sabeeha Merchant*

137 **Enhanced Sensitivity to Ethylene in Nitrogen- or Phosphate-Starved Roots of *Zea mays* L. during Aerenchyma Formation**—Chuan-Jiu He, Page W. Morgan, and Malcolm C. Drew*

143 **Nodules Initiated by *Rhizobium meliloti* Exopolysaccharide Mutants Lack a Discrete, Persistent Nodule Meristem**—Cheng Yang, Ethan R. Signer, and Ann M. Hirsch*

152 **Light Activation of Maize Phospho*enol*pyruvate Carboxylase Protein-Serine Kinase Activity Is Inhibited by Mesophyll and Bundle Sheath-Directed Photosynthesis Inhibitors**—Jin-an Jiao and Raymond Chollet*

157 **Differential Protein Accumulation in Banana Fruit during Ripening**—Eva Dominguez-Puigjaner, Miguel Vendrell*, and M. Dolors Ludevid

163 **Complete Amino Acid Sequence of Soybean Leaf P21. Similarity to the Thaumatin-Like Polypeptides**—John S. Graham*, William Burkhart, Jin Xiong, and Jeffrey W. Gillikin

166 **Rejuvenation of *Sequoia sempervirens* by Repeated Grafting of Shoot Tips onto Juvenile Rootstocks *in Vitro*. Model for Phase Reversal of Trees**—Li-Chun Huang, Suwenza Lius, Bau-Lian Huang, Toshio Murashige*, El Fatih M. Mahdi, and Richard Van Gundy

174 **Purification and Partial Characterization of Maize (*Zea mays* L.) β-Glucosidase**—Asim Esen

183 **Sidedness of Plant Plasma Membrane Vesicles Altered**

* Author to whom correspondence should be addressed.

Continued on next page

by Conditions of Preparation—Andrew O. Brightman and D. James Morré*

191 Gibberellic Acid Regulates Chalcone Synthase Gene Transcription in the Corolla of *Petunia hybrida*— David Weiss*, Rik van Blokland, Jan M. Kooter, Joseph N. M. Mol, and Arjen J. van Tunen

198 An Improved Method for Using Electrolyte Leakage to Assess Membrane Competence in Plant Tissues— Thomas H. Whitlow*, Nina L. Bassuk, Thomas G. Ranney, and Deborah L. Reichert

206 Expression of Constitutive and Tissue-Specific Acyl Carrier Protein Isoforms in *Arabidopsis*—Alenka Hloušek-Radojčić, Dusty Post-Beittenmiller, and John B. Ohlrogge*

215 Solubilization, Partial Purification, and Immunodetection of Squalene Synthetase from Tobacco Cell Suspension Cultures—Kathleen Hanley and Joseph Chappell*

221 Gibberellins and the Legume-*Rhizobium* Symbiosis. I. Endogenous Gibberellins of Lima Bean (*Phaseolus lunatus* L.) Stems and Nodules—Raymond C. Dobert, Stewart B. Rood, and Dale G. Blevins*

225 Cadmium-Sulfide Crystallites in Cd-(γEC)$_n$G Peptide Complexes from Tomato—R. Neil Reese*, Cindy A. White, and Dennis R. Winge

230 Aluminum Effects on Calcium Fluxes at the Root Apex of Aluminum-Tolerant and Aluminum-Sensitive Wheat Cultivars—Jianwei W. Huang, Jon E. Shaff, David L. Grunes, and Leon V. Kochian*

238 Identification and Analysis of a Barley cDNA Clone Encoding the 31-Kilodalton LHC IIa (CP29) Apoprotein of the Light-Harvesting Antenna Complex of Photosystem II—Daryl T. Morishige and J. Philip Thornber*

246 Stimulation of Root Elongation and Curvature by Calcium—Hideyuki Takahashi*, Tom K. Scott, and Hiroshi Suge

253 The Shibata Shift and the Transformation of Etioplasts to Chloroplasts in Wheat with Clomazone (FMC 57020) and Amiprophos-Methyl (Tokunol M)— Nancy N. Artus, Margareta Ryberg*, Agneta Lindsten, Hans Ryberg, and Christer Sundqvist

264 Arabinogalactan-Rich Glycoproteins Are Localized on the Cell Surface and in Intravacuolar Multivesicular Bodies—Eliot M. Herman* and Christopher J. Lamb

273 Variation of the Polypeptide Composition of Mitochondria Isolated from Different Potato Tissues— Catherine Colas des Francs-Small*, Françoise Ambard-Bretteville, Anny Darpas, Marc Sallantin, Jean-Claude Huet, Jean-Claude Pernollet, and René Rémy

279 Flow Cytometric Analysis of Rhodamine 123 Fluorescence during Modulation of the Membrane Potential in Plant Mitochondria—Patrice X. Petit

287 Sucrose Metabolism in Tubers of Potato (*Solanum tuberosum* L.). Effects of Sink Removal and Sucrose Flux on Sucrose-Degrading Enzymes—H. A. Ross* and H. V. Davies

294 Reduction of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase Content by Antisense RNA Reduces Photosynthesis in Transgenic Tobacco Plants— Graham S. Hudson*, John R. Evans, Susanne von Caemmerer, Yvonne B. C. Arvidsson, and T. John Andrews

303 Isolation, Purification, and Identification of 2-(*p*-Hydroxyphenoxy)-5,7-Dihydroxychromone: A Fungal-Induced Phytoalexin from *Cassia obtusifolia*— Amir Sharon, Rodolfo Ghirlando, and Jonathan Gressel*

309 Nitrate-Regulated Growth and Cytokinin Responses in Seminal Roots of Barley—Mariann E. Samuelson*, Lennart Eliasson, and Carl-Magnus Larsson

316 Diurnal Starch Accumulation and Utilization in Phosphorus-Deficient Soybean Plants—Jinshu Qiu and Daniel W. Israel*

324 Appearance of New Lipoxygenases in Soybean Cotyledons after Germination and Evidence for Expression of a Major New Lipoxygenase Gene— Tomohiko Kato, Hiroyuki Ohta, Kunisuke Tanaka, and Daisuke Shibata*

331 Purification and Properties of Glyoxysomal Cuprozinc Superoxide Dismutase from Watermelon Cotyledons (*Citrullus vulgaris* Schrad)—Pablo Bueno and Luis A. del Río*

337 Immunological Evidence of Thaumatin-Like Proteins during Tobacco Floral Differentiation—Luc Richard*, Montserrat Arró, Johan Hoebeke, D. Ry Meeks-Wagner, and Kiem Tran Thanh Van

343 Biosynthesis of Dehydrodiconiferyl Alcohol Glucosides: Implications for the Control of Tobacco Cell Growth—John D. Orr and David G. Lynn*

353 Water Deficit Induces Abscisic Acid Accumulation in Endosperm of Maize *Viviparous* Mutants—Eric S. Ober and Tim L. Setter*

357 Molecular Size and Separability Features of Pea Cell Wall Polysaccharides. Implications for Models of Primary Wall Structure—Lawrence D. Talbott and Peter M. Ray*

369 Changes in Molecular Size of Previously Deposited and Newly Synthesized Pea Cell Wall Matrix Polysaccharides. Effects of Auxin and Turgor—Lawrence D. Talbott and Peter M. Ray*

380 Phenylalanine Ammonia-Lyase from Loblolly Pine. Purification of the Enzyme and Isolation of Complementary DNA Clones—Ross W. Whetten* and Ronald R. Sederoff

COMMUNICATIONS

387 5′-CATGCAT-3′ Elements Modulate the Expression of Glycinin Genes—Jean-Marc Lelievre, Luiz O. Oliveira, and Niels C. Nielsen*

392 Occurrence of Temperature-Sensitive Phenotypic Plasticity in Chlorophyll-Deficient Mutants of *Arabi-*

***dopsis thaliana*—John Markwell* and John C. Osterman**

395 *nit 7*: A New Locus for Molybdopterin Cofactor Biosynthesis in the Green Alga *Chlamydomonas reinhardtii*—Miguel R. Aguilar, Rafael Prieto, Jacobo Cárdenas, and Emilio Fernández*

399 Mannosyl- and Xylosyl-Containing Glycans Promote Tomato (*Lycopersicon esculentum* Mill.) Fruit Ripening—Bernard Priem and Kenneth C. Gross*

402 Antipeptide Antibodies That Can Distinguish Specific Subunit Polypeptides of Glutamine Synthetase from Bean (*Phaseolus vulgaris* L.)—Xiaoyin Cai, Ralph L. Henry, Larry J. Takemoto, James A. Guikema, and Peter P. Wong*

PLANT GENE REGISTER

406 Nucleotide Sequence of the Photoregulated Maize Chloroplast *psaI* Gene, Encoding a 4.0-Kilodalton Component of Photosystem I—Steven R. Rodermel* and Lawrence Bogorad

408 Nucleotide Sequence of *S*-Adenosyl-L-Methionine: Magnesium Protoporphyrin Methyltransferase from *Rhodobacter capsulatus*—David W. Bollivar and Carl E. Bauer*

Number 2. February

ARTICLES

411 Effects of Anoxia on Mitochondrial Biogenesis in Rice Shoots. Modification of *in Organello* Translation Characteristics—Ivan Couée*, Séverine Defontaine, Jean-Pierre Carde, and Alain Pradet

422 Nitrate Reductase Regulates Expression of Nitrite Uptake and Nitrite Reductase Activities in *Chlamydomonas reinhardtii*—Aurora Galván, Jacobo Cárdenas, and Emilio Fernández*

427 Herbicide Clomazone Does Not Inhibit *in Vitro* Geranylgeranyl Synthesis from Mevalonate—Monte R. Weimer*, Nelson E. Balke, and Douglas D. Buhler

433 Role of the Amino- and Carboxy-Terminal Regions in the Folding and Oligomerization of Wheat High Molecular Weight Glutenin Subunits—Noam Shani, Jody D. Steffen-Campbell, Olin D. Anderson, Frank C. Greene, and Gad Galili*

442 Transport of Stachyose and Sucrose by Vacuoles of Japanese Artichoke (*Stachys sieboldii*) Tubers—Felix Keller

446 Identification of Low Molecular Mass GTP-Binding Proteins in Membranes of the Halotolerant Alga *Dunaliella salina*—María P. Rodríguez-Rosales, David L. Herrin, and Guy A. Thompson, Jr.*

452 Calcium Transport by Corn Mitochondria. Evaluation of the Role of Phosphate—Marco Aurelio P. Silva, Eva G. S. Carnieri, and Anibal E. Vercesi*

458 Expression of Maize Phospho*enol*pyruvate Carboxylase in Transgenic Tobacco. Effects on Biochemistry and Physiology—Richard L. Hudspeth*, John W. Grula, Ziyu Dai, Gerald E. Edwards, and Maurice S. B. Ku

465 Induction of 1-Aminocyclopropane-1-Carboxylate Synthase mRNA by Auxin in Mung Bean Hypocotyls and Cultured Apple Shoots—Woo Taek Kim*, Aron Silverstone, Wing Kin Yip, Jian Guo Dong, and Shang Fa Yang

472 Microheterogeneity in Purified Broad Bean Polyphenol Oxidase—Chandrashekar Ganesa, Mary T. Fox, and William H. Flurkey*

480 Contribution of Malate and Amino Acid Metabolism to Cytoplasmic pH Regulation in Hypoxic Maize Root Tips Studied Using Nuclear Magnetic Resonance Spectroscopy—Justin K. M. Roberts*, Mark A. Hooks, Aaron P. Miaullis, Shaune Edwards, and Cecelia Webster

488 Auxin and Growth Regulation of Rice Coleoptile Segments. Molecular Analysis—Diego Breviario*, Silvia Gianì, Paolo Di Vietri, and Immacolata Coraggio

496 Wounding Induces One of Two Isoenzymes of 3-Deoxy-D-*arabino*-Heptulosonate 7-Phosphate Synthase in *Solanum tuberosum* L.—Gloria K. Muday and Klaus M. Herrmann*

501 Seasonal Variation in the Antioxidant System of Eastern White Pine Needles. Evidence for Thermal Dependence—James V. Anderson, Boris I. Chevone*, and John L. Hess

509 Distribution of Napin and Cruciferin in Developing Rape Seed Embryos—Anna-Stina Höglund*, Joakim Rödin, Erik Larsson, and Lars Rask

516 Regulation of Photosynthetic Rate of Two Sunflower Hybrids under Water Stress—Carmen Gimenez, Valerie J. Mitchell, and David W. Lawlor*

525 Evaluation of the Extent of Homologous Chloroplast DNA Sequences in the Mitochondrial Genome of Cowpea (*Vigna unguiculata* L.)—Elena G. Orellano, Néstor Carrillo*, and Nora B. Calcaterra

530 Cellulase Occurs in Multiple Active Forms in Ripe Avocado Fruit Mesocarp—Angelos K. Kanellis* and Panagiotis Kalaitzis

535 Some Enzymes and Properties of the Reductive Carboxylic Acid Cycle Are Present in the Green Alga *Chlamydomonas reinhardtii* F-60—Changguo Chen and Martin Gibbs*

540 Stomatal Response to Abscisic Acid Is a Function of Current Plant Water Status—François Tardieu* and William J. Davies

546 Photoaffinity Labeling of Mature and Precursor Forms of the Small Subunit of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase after Expression in *Escherichia coli*—Robert R. Klein* and Michael E. Salvucci

554 Ripening-Related Gene from Avocado Fruit. Ethylene-

Inducible Expression of the mRNA and Polypeptide—Douglas J. McGarvey, Reidun Sirevåg, and Rolf E. Christoffersen*

560 **Na^+-Independent HCO_3^- Transport and Accumulation in the Cyanobacterium *Synechococcus* UTEX 625**—George S. Espie* and Ramani A. Kandasamy

569 **Overproduction of γ-Linolenic and Eicosapentaenoic Acids by Algae**—Zvi Cohen*, Shoshana Didi, and Yair M. Heimer

573 **Decrease of Nitrate Reductase Activity in Spinach Leaves during a Light-Dark Transition**—Burgi Riens and Hans Walter Heldt*

578 **Carbon Oxysulfide Inhibition of the CO_2-Concentrating Process of Unicellular Green Algae**—Arun Goyal, Yoshihiro Shiraiwa, and N. Edward Tolbert*

584 **Regulation of Nodule Glutamine Synthetase by CO_2 Levels in Bean (*Phaseolus vulgaris* L.)**—José-Luis Ortega, Federico Sánchez, Mario Soberón, and Miguel Lara Flores*

588 **Partial Purification and Characterization of Complex I, NADH:Ubiquinone Reductase, from the Inner Membrane of Beetroot Mitochondria**—Kathleen L. Soole, Ian B. Dry, and Joseph T. Wiskich*

595 **Processing of the Precursors for the Light-Harvesting Chlorophyll-Binding Proteins of Photosystem II and Photosystem I during Import and in an Organelle-Free Assay**—Steven E. Clark and Gayle K. Lamppa*

602 **Metabolism of *ent*-Kaurene to Gibberellin A_{12}-Aldehyde in Young Shoots of Normal Maize**—Yoshihito Suzuki, Hisakazu Yamane, Clive R. Spray, Paul Gaskin, Jake MacMillan, and Bernard O. Phinney*

611 **Transport Kinetics and Metabolism of Exogenously Applied Putrescine in Roots of Intact Maize Seedlings**—Joseph M. DiTomaso*, Jonathan J. Hart, and Leon V. Kochian

621 **Differential Expression of Histone H3 Gene Variants during Cell Cycle and Somatic Embryogenesis in Alfalfa**—Tamás Kapros*, László Bögre, Kinga Németh, László Bakó, János Györgyey, Sheng Cheng Wu, and Dénes Dudits

626 **Influence of NaCl on Growth, Proline, and Phospho*enol*pyruvate Carboxylase Levels in *Mesembryanthemum crystallinum* Suspension Cultures**—John C. Thomas*, Richard L. De Armond, and Hans J. Bohnert

632 **Mechanism of Aluminum Inhibition of Net $^{45}Ca^{2+}$ Uptake by *Amaranthus* Protoplasts**—Zdenko Rengel* and Daphne C. Elliott

639 **Differential Inhibition by Ferulic Acid of Nitrate and Ammonium Uptake in *Zea mays* L.**—Christine L. Bergmark, William A. Jackson*, Richard J. Volk, and Udo Blum

646 **Changes in Esterification of the Uronic Acid Groups of Cell Wall Polysaccharides during Elongation of Maize Coleoptiles**—Jong-Bum Kim and Nicholas C. Carpita*

654 **Glyphosate Suppression of an Elicited Defense Response. Increased Susceptibility of *Cassia obtusifolia* to a Mycoherbicide**—Amir Sharon, Ziva Amsellem, and Jonathan Gressel*

660 **Heterogenous Stomatal Closure in Response to Leaf Water Deficits Is Not a Universal Phenomenon**—Dhammika Gunasekera and Gerald A. Berkowitz*

666 **Stromal pH and Photosynthesis Are Affected by Electroneutral K^+ and H^+ Exchange through Chloroplast Envelope Ion Channels**—Weihua Wu and Gerald A. Berkowitz*

673 **Characterization of Parameters Influencing Receptor-Mediated Endocytosis in Cultured Sobyean Cells**—Mark A. Horn, Peter F. Heinstein, and Philip S. Low*

680 **Effect of Elicitation and Changes in Extracellular pH on the Cytoplasmic and Vacuolar pH of Suspension-Cultured Soybean Cells**—Mark A. Horn, Robert P. Meadows, Izydor Apostol, Claude R. Jones, David G. Gorenstein, Peter F. Heinstein, and Philip S. Low*

687 **Complementary DNA Cloning of Poplar Bark Storage Protein and Control of Its Expression by Photoperiod**—Gary D. Coleman*, Tony H. H. Chen, and Leslie H. Fuchigami

694 **Photosynthesis and Photorespiration in Presenescent, Senescent, and Rejuvenated Soybean Cotyledons**—Laura Fredrick Marek* and Cecil R. Stewart

700 **Changes in the Polypeptide Patterns of Barley Seedlings Exposed to Jasmonic Acid and Salinity**—Liliana Todorova Maslenkova, Tania Simeonova Miteva, and Losanka P. Popova*

708 **β-Furfuryl-β-Glucoside: An Endogenous Activator of Higher Plant UDP-Glucose:(1–3)-β-Glucan Synthase. Biological Activity, Distribution, and *in Vitro* Synthesis**—Patricia Ohana, Deborah P. Delmer, Gail Volman, John C. Steffens, David E. Matthews, and Moshe Benziman*

716 **Variability in Proline-Accumulating Ability of Barley (*Hordeum vulgare* L.) Cultivars Induced by Vapor Pressure Deficit**—Bodapati P. Naidu, Donald Aspinall, and Leslie G. Paleg*

723 **Energy Requirements for Fatty Acid and Glycerolipid Biosynthesis from Acetate by Isolated Pea Root Plastids**—Kathryn F. Kleppinger-Sparace, Richard J. Stahl, and Salvatore A. Sparace*

728 **Rapid Activation of Phenylpropanoid Metabolism in Elicitor-Treated Hybrid Poplar (*Populus trichocarpa* Torr. & Gray × *Populus deltoides* Marsh) Suspension-Cultured Cells**—Mário Moniz de Sá, Rajgopal Subramaniam, Frank E. Williams, and Carl J. Douglas*

738 **Oxidation and Reduction of Sulfite by Chloroplasts and Formation of Sulfite Addition Compounds**—Andreas P. M. Dittrich, Hardy Pfanz, and Ulrich Heber*

COMMUNICATIONS

745 **Abscisic Acid Increases Terrestrial Plant Cell Resistance to Hydrostatic Pressure**—Karen K. Tanino*,

Tony H. H. Chen, Leslie H. Fuchigami, and Conrad J. Weiser

749 **Low Measuring Temperature Induced Artifactual Increase in Chlorophyll *a* Fluorescence**—Norman P. A. Huner, Gunnar Öquist*, and Lars-Göran Sundblad

753 **High Performance Liquid Chromatography Analysis of Carbohydrates of Cotton-Phloem Sap and of Honeydew Produced by *Bemisia tabaci* Feeding on Cotton**—Mitchell C. Tarczynski*, David N. Byrne, and William B. Miller

757 **CO_2 Inhibits Respiration in Leaves of *Rumex crispus* L.**—Jeffrey S. Amthor*, George W. Koch, and Arnold J. Bloom

761 **Light and Fungal Elicitor Induce 3-Deoxy-D-*arabino*-Heptulosonate 7-Phosphate Synthase mRNA in Suspension Cultured Cells of Parsley (*Petroselinum crispum* L.)**—John M. Henstrand, Kent F. McCue, Kent Brink, Avtar K. Handa, Klaus M. Hermann, and Eric E. Conn*

764 **Simple Determination of the CO_2/O_2 Specificity of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase by the Specific Radioactivity of [^{14}C]Glycerate 3-Phosphate**—Genhai Zhu, Richard G. Jensen*, Richard B. Hallick, and Gunter F. Wildner

769 **Behavior of Etiolated Peas (*Pisum sativum* cv Alaska) When Obstructed by a Mechanical Barrier**—David A. Schwarzbach, Ernst J. Woltering, and Mikal E. Saltveit*

774 **Hysteresis and Cooperative Behavior of a Latent Plant Polyphenoloxidase**—Edelmira Valero and Francisco García-Carmona*

777 **Induction of Pseudoactinorhizae by the Plant Pathogen *Agrobacterium rhizogenes***—R. Howard Berg, Lixia Liu, Jeffrey O. Dawson*, Michael A. Savka, and Stephen K. Farrand

780 **Role of Cysteine in Activation and Allosteric Regulation of Maize Phospho*enol*pyruvate Carboxylase**—Thierry P. Chardot and Randolph T. Wedding*

784 **Mannityl Opine Accumulation and Exudation of Transgenic Tobacco**—Michael A. Savka* and Stephen K. Farrand

PLANT GENE REGISTER

790 **Cloning and Nucleotide Sequence of a Complementary DNA Encoding the Cytosolic Fructose-1,6-Bisphosphatase of Sugar Beet (*Beta vulgaris* L.)**—Chee Harn and Jaleh Daie*

792 **Nucleotide Sequence of a Soybean Vegetative Storage Protein *vspA* Gene**—Yoon Rhee and Paul E. Staswick*

794 **Nucleotide Sequence of a Soybean Vegetative Storage Protein *vspB* Gene**—Yoon Rhee and Paul E. Staswick*

796 **Nucleotide Sequence of a Complementary DNA Encoding *O*-Methyltransferase from Poplar**—Bernard Dumas, Jan Van Doorsselaere, Jan Gielen, Michel Legrand, Bernard Fritig, Marc Van Montagu*, and Dirk Inzé

798 **Molecular Analysis of the *psaC* Gene Encoding the F_A/F_B Apoprotein of Photosystem I in the Filamentous Cyanobacterium *Anabaena variabilis* ATCC 29413**—R. Mannar Mannan and Himadri B. Pakrasi*

Number 3. March

ARTICLES

801 **Dependence of Photosynthesis of Sunflower and Maize Leaves on Phosphate Supply, Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase Activity, and Ribulose-1,5-Bisphosphate Pool Size**—James Jacob* and David W. Lawlor

808 **Photo and Nutritional Regulation of the Light-Harvesting Chlorophyll *a/b*-Binding Protein of Photosystem II mRNA Levels in *Euglena***—Ram Kishore and Steven D. Schwartzbach*

813 **Purification and Characterization of Dihydrodipicolinate Synthase from Pea**—Catherine Dereppe, Guido Bold, Oreste Ghisalba, Edith Ebert, and Hans-Peter Schär*

822 **Gametic Differentiation of *Chlamydomonas reinhardtii*. Control by Nitrogen and Light**—Christoph F. Beck* and Axel Acker

827 **Comparison of Developmental Gradients for Growth, ATPase, and Fusicoccin-Binding Activity in Mung Bean Hypocotyls**—Leslie E. Basel* and Robert E. Cleland

835 **Light Regulation of the Growth Response in Corn Root Gravitropism**—Maureen O. Kelly and A. Carl Leopold*

840 **Gradients of Turgor, Osmotic Pressure, and Water Potential in the Cortex of the Hypocotyl of Growing *Ricinus* Seedlings. Effects of the Supply of Water from the Xylem and of Solutes from the Phloem**—Anatoli Meshcheryakov, Ernst Steudle*, and Ewald Komor

853 **Glutathione Depletion Due to Copper-Induced Phytochelatin Synthesis Causes Oxidative Stress in *Silene cucubalus***—C. H. Ric De Vos*, Marjolein J. Vonk, Riet Vooijs, and Henk Schat

859 **Coregulation of Soybean Vegetative Storage Protein Gene Expression by Methyl Jasmonate and Soluble Sugars**—Hugh S. Mason*, Daryll B. DeWald, Robert A. Creelman, and John E. Mullet

868 **Aspartate Aminotransferase in Effective and Ineffective Alfalfa Nodules. Cloning of a cDNA and Deter-**

mination of Enzyme Activity, Protein, and mRNA Levels—J. Stephen Gantt, Ruby J. Larson, Mark W. Farnham, Sudam M. Pathirana, Susan S. Miller, and Carroll P. Vance*

879 **Circadian Rhythms of Chemotaxis to Ammonium and of Methylammonium Uptake in *Chlamydomonas***—Thomas Edward Byrne, Marion Robert Wells, and Carl Hirschie Johnson*

887 **Identification and Characterization of Glycolate Oxidase and Related Enzymes from the Endocyanotic Alga *Cyanophora paradoxa* and from Pea Leaves**—Thomas Betsche*, Dietmar Schaller, and Michael Melkonian

894 **Nitrogenase Activity, Nodule Respiration, and O_2 Permeability Following Detopping of Alfalfa and Birdsfoot Trefoil**—R. Ford Denison*, Stephen Hunt, and David B. Layzell

901 **Mathematical Modeling of Oxygen Diffusion and Respiration in Legume Root Nodules**—R. Ford Denison

908 **Bound Water in Durum Wheat under Drought Stress**—Agata Rascio*, Cristiano Platani, Natale Di Fonzo, and Giovanni Wittmer

913 **Immunological Detection of Acetaldehyde-Protein Adducts in Ethanol-Treated Carrot Cells**—Pierdomenico Perata, Paolo Vernieri, Doretta Armellini, Massimo Bugnoli, Franco Tognoni, and Amedeo Alpi*

919 **A Repetitive Proline-Rich Protein from the Gymnosperm Douglas Fir Is a Hydroxyproline-Rich Glycoprotein**—Marcia Kieliszewski*, Renate de Zacks, Joseph F. Leykam, and Derek T. A. Lamport

927 **Subcellular Distribution of *O*-Acetylserine(thiol)lyase in Cauliflower (*Brassica oleracea* L.) Inflorescence**—Norbert Rolland, Michel Droux, and Roland Douce*

936 **Biosynthesis and Secretion of Cryptogein, a Protein Elicitor Secreted by *Phytophthora cryptogea***—Thérèse Tercé-Laforgue*, Jean-Claude Huet, and Jean-Claude Pernollet

942 **Urease-Null and Hydrogenase-Null Phenotypes of a Phylloplane Bacterium Reveal Altered Nickel Metabolism in Two Soybean Mutants**—Mark A. Holland* and Joseph C. Polacco

949 **Leaf Photosynthesis and Respiration of High CO_2-Grown Tobacco Plants Selected for Survival under CO_2 Compensation Point Conditions**—Esteban Delgado, Joaquim Azcón-Bieto*, Xavier Aranda, Javier Palazón, and Hipólito Medrano

955 **Identification and Kinetics of Accumulation of Proteins Induced by Ethylene in Bean Abscission Zones**—Elena del Campillo* and Lowell N. Lewis

962 **Nondwarf Rice Seedling Bioassay for Gibberellins**—Takaaki Nishijima*, Masaji Koshioka, and Hiroko Yamaji

966 **Alteration of Components of Leaf Water Potential and Water Content in Velvetleaf under the Effects of Long-Term Humidity Difference**—Yao-Hua Luo* and Boyd R. Strain

971 **Identification and Characterization of Lipoxygenase Isoforms in Senescing Carnation Petals**—Marie-Aude Rouet-Mayer, Jean-Marc Bureau, and Christiane Laurière*

979 **Hormone-Resistant Mutants of *Arabidopsis* Have an Attenuated Response to *Agrobacterium* Strains**—Cynthia Lincoln, Joceyln Turner, and Mark Estelle*

984 **Differential Carbon Monoxide Sensitivity of Cytochrome *c* Oxidase in the Leaves of C_3 and C_4 Plants**—Rajeev M. Naik*, Ashok R. Dhage, Shivaji V. Munjal, Prikshayat Singh, Babasaheb B. Desai, Shanti L. Mehta, and Manohar S. Naik

988 **Relationship between Electron Transport across the Plasmalemma and a pH Decrease in the Bulk Medium**—Bernard Rubinstein*, Arthur I. Stern, and Jonathan D. C. Chalmers

995 **Regulation of Expression of Proteinase Inhibitor Genes by Methyl Jasmonate and Jasmonic Acid**—Edward E. Farmer, Russell R. Johnson, and Clarence A. Ryan*

1003 **Regulation of Phycobilisome Structure and Gene Expression by Light Intensity**—Robert M. de Lorimier, Russell L. Smith, and S. Edward Stevens, Jr.*

1011 **Differential Synthesis of Photosystem Cores and Light-Harvesting Antenna during Proplastid to Chloroplast Development in *Spirodela oligorrhiza***—Dennis J. McCormac and Bruce M. Greenberg*

1020 **Proline Fed to Intact Soybean Plants Influences Acetylene Reducing Activity and Content and Metabolism of Proline in Bacteroids**—Yuxian Zhu, Georgia Shearer, and Daniel H. Kohl*

1029 **Some Properties of a Functional Reconstituted Plasmalemma H^+-ATPase Activated by Fusicoccin**—Mauro Marra, Alessandro Ballio, Maria Rosaria Fullone, and Patrizia Aducci*

1035 **Comparison of Benzyl Adenine Metabolism in Two *Petunia hybrida* Lines Differing in Shoot Organogenesis**—Carol A. Auer*, Jerry D. Cohen, Michel Laloue, and Todd J. Cooke

1042 **Physiological Changes Accompanying Senescence in the Ephemeral Daylily Flower**—Roderick L. Bieleski* and Michael S. Reid

1050 **Physical Trauma and Tungsten Toxicity Reduce the Efficiency of Biolistic Transformation**—Julie A. Russell*, Mihir K. Roy, and John C. Sanford

1057 **Quantitative Models Characterizing Seed Germination Responses to Abscisic Acid and Osmoticum**—Bing-Rui Ni and Kent J. Bradford*

1069 **Regulation of Photosynthesis in Triazine-Resistant and -Susceptible *Brassica napus***—Jack H. Dekker* and Thomas D. Sharkey

1074 **Characterization of δ-Aminolevulinic Acid Formation in Soybean Root Nodules**—Indu Sangwan and Mark R. O'Brian*

1080 **α-Amylase Isoforms are Posttranslationally Modified in the Endomembrane System of the Barley Aleurone Layer**—Liliane Sticher and Russell L. Jones*

1087 **K^+ Channels Are Responsible for an Inwardly Rectify-**

ing Current in the Plasma Membrane of Mesophyll Protoplasts of *Avena sativa*—Joseph Kourie and Mary Helen M. Goldsmith*

1098 Endosperm Acidification and Related Metabolic Changes in the Developing Barley Grain—Peter K. Macnicol* and John V. Jacobsen

1105 Changes in Activities of Enzymes of Carbon Metabolism in Leaves during Exposure of Plants to Low Temperature—A. Scott Holaday, Wayne Martindale, Rhu Alred, Andrew L. Brooks, and Richard C. Leegood*

1115 Purification and Characterization of a 70-Kilodalton Polyadenylate-Binding Protein from Pea (*Pisum sativum*)—Jianjun Yang and Arthur G. Hunt*

1121 Modification by Ethylene of the Cell Growth Pattern in Different Tissues of Etiolated Lupine Hypocotyls—José Sánchez-Bravo*, Ana M. Ortuño, Manuela Pérez-Gilabert, Manuel Acosta, and Francisco Sabater

1128 Phosphorus Nutrition Influence on Leaf Senescence in Soybean—Steven J. Crafts-Brandner

1133 Phosphorus Nutrition Influence on Starch and Sucrose Accumulation, and Activities of ADP-Glucose Pyrophosphorylase and Sucrose-Phosphate Synthase during the Grain Filling Period in Soybean—Steven J. Crafts-Brandner

1139 Partial Purification and Characterization of Lysine-Ketoglutarate Reductase in Normal and Opaque-2 Maize Endosperms—Marcia R. Brochetto-Braga, Adilson Leite, and Paulo Arruda*

1148 Diacylglycerol Kinase from Suspension Cultured Plant Cells. Characterization and Subcellular Localization—Josef B. Wissing and Karl G. Wagner*

1154 Characterization of the Expression of the Photosystem II-Oxygen Evolving Complex in C_4 Species of *Flaveria*—Susan L. Ketchner and Richard T. Sayre*

1163 Sucrose Synthase in Wild Tomato, *Lycopersicon chmielewskii*, and Tomato Fruit Sink Strength—Jindong Sun, Tadeusz Loboda, Shi-Jean S. Sung, and Clanton C. Black, Jr.*

1170 Posttranslational Modifications in the Amino-Terminal Region of the Large Subunit of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase from Several Plant Species—Robert L. Houtz*, Loelle Poneleit, Samantha B. Jones, Malcolm Royer, and John T. Stults

1175 Relationships among Isoprene Emission Rate, Photosynthesis, and Isoprene Synthase Activity as Influenced by Temperature—Russell K. Monson*, Charles H. Jaeger, William W. Adams III, Edward M. Driggers, Gary M. Silver, and Ray Fall

1181 Growth and Movement of Spot Inoculated *Rhizobium meliloti* on the Root Surface of Alfalfa—Gustavo Caetano-Anollés, Elizabeth Wrobel-Boerner, and Wolfgang D. Bauer*

1190 Regulation of Glutamate Dehydrogenase Activity in Relation to Carbon Limitation and Protein Catabolism in Carrot Cell Suspension Cultures—Sharon A. Robinson*, George R. Stewart, and Richard Phillips

1196 Plasma Membrane Ca-ATPase of Radish Seedlings. I. Biochemical Characterization Using ITP as a Substrate—Antonella Carnelli, Maria I. De Michelis, and Franca Rasi-Caldogno*

1202 Plasma Membrane Ca-ATPase of Radish Seedlings. II. Regulation by Calmodulin—Franca Rasi-Caldogno*, Antonella Carnelli, and Maria I. De Michelis

COMMUNICATIONS

1207 Changes in Soluble Carbohydrates during Seed Storage—Irma Bernal-Lugo and A. Carl Leopold*

1211 Novel Light-Regulated Chloroplast Thylakoid Membrane Protein—Kent O. Burkey

PLANT GENE REGISTER

1214 Genomic Nucleotide Sequence of a Wild-Type Shrunken-2 Allele of *Zea mays*—Janine R. Shaw and L. Curtis Hannah*

Number 4. April

REVIEW

1217 Oxidation and Reduction of Leghemoglobin in Root Nodules of Leguminous Plants—Manuel Becana* and Robert V. Klucas

ARTICLES

1222 Magnesium Deficiency and High Light Intensity Enhance Activities of Superoxide Dismutase, Ascorbate Peroxidase, and Glutathione Reductase in Bean Leaves—Ismail Cakmak and Horst Marschner*

1228 Effects of Abscisic Acid Treatment on the Thermostability of the Photosynthetic Apparatus in Barley Chloroplasts—Alexander G. Ivanov, Maia I. Kitcheva, Alexander M. Christov, and Losanka P. Popova*

1233 Malate- and Pyruvate-Dependent Fatty Acid Synthesis in Leucoplasts from Developing Castor Endosperm—Ronald G. Smith*, David A. Gauthier, David T. Dennis, and David H. Turpin

1239 Glycopeptide Elicitors of Stress Responses in Tomato Cells. *N*-Linked Glycans Are Essential for Activity but Act as Suppressors of the Same Activity when Released from the Glycopeptides—Christoph W. Basse and Thomas Boller*

1248 Characterization of the Major Integral Protein of Vacuolar Membrane—Masayoshi Maeshima

1255 Transcriptional Regulation of Nitrate Reductase

mRNA Levels by Cytokinin-Abscisic Acid Interactions in Etiolated Barley Leaves—Jia-ling Lu, John R. Ertl, and Chong-maw Chen*

1261 **RNA Editing of Cytochrome Oxidase Subunit III in Sunflower Mitochondria**—Adolfo Saiardi and Carla Quagliariello*

1264 **Purification and Properties of Putrescine Hydroxycinnamoyl Transferase from Tobacco (*Nicotiana tabacum*) Cell Suspensions**—Jonathan Negrel*, Michel Paynot, and Francine Javelle

1270 **Ethrel (Ethylene Releaser)-Induced Increases in the Adenylate Pool and Transtonoplast ΔpH within *Hevea* Latex Cells**—Zakia Amalou, Jacques Bangratz, and Hervé Chrestin*

1277 **Characterization and Subcellular Localization of Debranching Enzyme and Endoamylase from Leaves of Sugar Beet**—Bin Li, Jerome C. Servaites, and Donald R. Geiger*

1285 **Functional Importance of Arginine 64 in *Chlamydomonas reinhardtii* Phosphoribulokinase**—Keith R. Roesler, Beverly L. Marcotte, and William L. Ogren*

1290 **Interactions of Avocado (*Persea americana*) Cytochrome P-450 with Monoterpenoids**—David L. Hallahan*, Jonathan H. A. Nugent, Beverly J. Hallahan, Glenn W. Dawson, Diane W. Smiley, Jevon M. West, and Roger M. Wallsgrove

1298 **Comparison of the Outer and Inner Epidermis. Inhibition of Auxin-Induced Elongation of Maize Coleoptiles by Glucan Antibodies**—Takayuki Hoson, Yoshio Masuda, and Donald J. Nevins*

1304 **Phytoalexin Accumulation in *Arabidopsis thaliana* during the Hypersensitive Reaction to *Pseudomonas syringae* pv *syringae***—Jun Tsuji, Evelyn P. Jackson, Douglas A. Gage, Raymond Hammerschmidt, and Shauna C. Somerville*

1310 **Internal CO_2 Measured Directly in Leaves. Abscisic Acid and Low Leaf Water Potential Cause Opposing Effects**—Michael J. Lauer* and John S. Boyer

1317 **Purification, Characterization, and Immunological Properties of NADH-Dependent Glutamate Synthase from Rice Cell Cultures**—Toshihiko Hayakawa, Tomoyuki Yamaya*, Kazunari Kamachi, and Kunihiko Ojima

1323 **Changes in Cytosolic Glutamine Synthetase Polypeptide and its mRNA in a Leaf Blade of Rice Plants during Natural Senescence**—Kazunari Kamachi, Tomoyuki Yamaya*, Toshihiko Hayakawa, Tadahiko Mae, and Kunihiko Ojima

1330 **Factors Affecting Expression of Enhanced Catalase Activity in a Tobacco Mutant with O_2-Resistant Photosynthesis**—Israel Zelitch

1336 **Cell Wall Free Space of *Cucumis* Hypocotyls Contains NAD and a Blue Light-Regulated Peroxidase Activity**—James R. Shinkle*, Steven J. Swoap, Patrice Simon, and Russell L. Jones

1342 **Metabolism of 1-Aminocycloproprane-1-Carboxylic Acid in Etiolated Maize Seedlings Grown under Mechanical Impedance**—Jorge I. Sarquis, Page W. Morgan*, and Wayne R. Jordan

1349 **Synergistic Effect of Light and Fusicoccin on Stomatal Opening. Epidermal Peel and Patch Clamp Experiments**—Sarah M. Assmann* and Amnon Schwartz

1356 **Regulation of *Em* Gene Expression in Rice. Interaction between Osmotic Stress and Abscisic Acid**—Richard M. Bostock and Ralph S. Quatrano*

1364 **Purification, Characterization, and Cloning of Cinnamyl Alcohol Dehydrogenase in Loblolly Pine (*Pinus taeda* L.)**—David M. O'Malley*, Stephanie Porter, and Ronald R. Sederoff

1372 **Inhibition of Violaxanthin Deepoxidation by Ultraviolet-B Radiation in Isolated Chloroplasts and Intact Leaves**—Erhard E. Pfündel*, Run-Sun Pan, and Richard A. Dilley

1381 **Phase Shift in Leaf Movements of *Xanthium* Attributed to Age and Rhythm Patterns**—Willard L. Koukkari, LeAnne Carlson Hobbs, and Frank B. Salisbury*

1386 ***In Situ* Abscisic Acid Synthesis. A Requirement for Induction of Embryo Dormancy in *Helianthus annuus***—Marie-Thérèse Le Page-Degivry* and Ginette Garello

1391 **Abscisic Acid and the Maturation of Cacao Embryos *in Vitro***—Valerie Creaser Pence

1396 **Mannitol Synthesis in Higher Plants. Evidence for the Role and Characterization of a NADPH-Dependent Mannose 6-Phosphate Reductase**—Wayne H. Loescher*, R. Huw Tyson, John D. Everard, Robert J. Redgwell, and Roderick L. Bieleski

1403 **Effects of Nitrate and Ammonium on Gene Expression of Phospho*enol*pyruvate Carboxylase and Nitrogen Metabolism in Maize Leaf Tissue during Recovery from Nitrogen Stress**—Bambang Sugiharto and Tatsuo Sugiyama*

1409 **Translational Regulation of the Large and Small Subunits of Ribulose Bisphosphate Carboxylase/Oxygenase during Induction of the CO_2-Concentrating Mechanism in *Chlamydomonas reinhardtii***—Thomas L. Winder, James C. Anderson, and Martin H. Spalding*

1415 **Effect of Diclofop on the Membrane Potentials of Herbicide-Resistant and -Susceptible Annual Ryegrass Root Tips**—Richard H. Shimabukuro* and Barry L. Hoffer

1423 **Development of the Potential for Cyanogenesis in Maturing Black Cherry (*Prunus serotina* Ehrh.) Fruits**—Elisabeth Swain, Chung Ping Li, and Jonathan E. Poulton*

1429 **Theoretical Considerations when Estimating the Mesophyll Conductance to CO_2 Flux by Analysis of the Response of Photosynthesis to CO_2**—Peter C. Harley, Francesco Loreto, Giorgio Di Marco, and Thomas D. Sharkey*

1437 **Estimation of Mesophyll Conductance to CO_2 Flux by Three Different Methods**—Francesco Loreto, Peter C. Harley, Giorgio Di Marco, and Thomas D. Sharkey*

1444 **Protein Differences between Two Isogenic Cultivars of Barley (*Hordeum vulgare* L.) that Differ in Sen-**

sitivity to Photoperiod and Far-Red Light—Jan M. Principe, William R. Hruschka, Brian Thomas, and Gerald F. Deitzer*

1451 **Factors Affecting the Acetylene-Induced Decline during Nitrogenase Assays in Root Nodules of *Myrica gale* L.**—John D. Tjepkema* and Christa R. Schwintzer

1460 **Sugar Concentrations in Guard Cells of *Vicia faba* Illuminated with Red or Blue Light. Analysis by High Performance Liquid Chromatography**—Matthew Poffenroth, David B. Green, and Gary Tallman*

1472 **Phosphate-Regulated Induction of Intracellular Ribonucleases in Cultured Tomato (*Lycopersicon esculentum*) Cells**—Andreas Löffler, Steffen Abel, Wolfgang Jost, Jaap J. Beintema, and Konrad Glund*

1479 **Inhibition of Sucrose Enhancer Effect of the Potato Proteinase Inhibitor II Promoter by Salicylic Acid**—Seong-Ryong Kim, Younghee Kim, Michael A. Costa, and Gynheung An*

1484 **Role of Abscisic Acid in the Induction of Desiccation Tolerance in Developing Seeds of *Arabidopsis thaliana***—Cor Meurs, Amarjit S. Basra, Cees M. Karssen, and Leendert C. van Loon*

COMMUNICATIONS

1494 **Two Types of Channels Involved in the Malate Ion Transport across the Tonoplast of a Crassulacean Acid Metabolism Plant**—Ikuko Iwasaki*, Hiroyuki Arata, Hiromasa Kijima, and Mitsuo Nishimura

1498 **Evidence of Two Isomers of Phosphatidylinositol in Plant Tissue**—Pushpalatha P. N. Murthy*, Gay Pliska-Matyshak, Lisa M. Keranen, Philippe Lam, Hans H. Mueller, and N. Bhuvarahamurthy

1502 **Pathogenesis-Related Proteins and Polyamines in a Developmental Mutant of Tomato, *Epinastic***—José M. Bellés, Pablo Tornero, and Vicente Conejero*

1506 **Amino Acid Sequence and Molecular Weight of Native NADP Malate Dehydrogenase from the C_4 Plant *Zea mays***—Anthony Agostino, Peter Jeffrey, and Marshall D. Hatch*

1511 **Phytochrome Activation of K^+ Channels and Chloroplast Rotation in *Mougeotia*. Action Spectra**—Roger R. Lew*, Flora Krasnoshtein, Bruce S. Serlin, and Charles L. Schauf

1515 **Clomazone Does Not Inhibit the Conversion of Isopentenyl Pyrophosphate to Geranyl, Farnesyl, or Geranylgeranyl Pyrophosphate *in Vitro***—Rodney Croteau

PLANT GENE REGISTER

1518 **H-Protein of the Glycine Decarboxylase Multienzyme Complex. Complementary DNA Encoding the Protein from *Arabidopsis thaliana***—R. Srinivasan and David J. Oliver*

1520 **Nucleotide Sequences of cDNAs Encoding Two Members of the Brazil Nut Methionine-Rich 2S Albumin Gene Family**—Susan B. Altenbach*, Karen W. Pearson, and Samuel S. M. Sun

1523 **Sequences of the Cotton Group 2 LEA/RAB/Dehydrin Proteins Encoded by *Lea3* cDNAs**—Glenn A. Galau* and Timothy J. Close

1526 **Isolation and Characterization of a Gene Encoding a Carboxypeptidase Y-Like Protein from *Arabidopsis thaliana***—Douglas Bradley

1530 **Sequence of a cDNA Coding for a 1-Aminocyclopropane-1-Carboxylate Oxidase Homolog from Apple Fruit**—Jian Guo Dong, David Olson, Aron Silverstone, and Shang Fa Yang*

1532 **Complementary DNA Sequence of a Low Temperature-Induced *Brassica napus* Gene with Homology to the *Arabidopsis thaliana kin1* Gene**—Winson Orr*, Betty Iu, Theresa C. White, Laurian S. Robert, and Jas Singh

1535 **Tomato Acid Phosphatase-1 Gene from a Nematode Resistant Cultivar**—Jack L. Erion*, Barbara Ballo, Tim W. Fox, and Lisa A. May

1538 **Barley (*Hordeum vulgare*) Gene for CP29, a Core Chlorophyll *a/b* Binding Protein of Photosystem II**—Annette B. Sørensen, Birgit F. Lauridsen, and Kirsten Gausing*

1541 **Nucleotide Sequence of the *psb*B Gene of *Chlamydomonas reinhardtii* Chloroplasts**—Sandra L. Berry-Lowe, Clayton H. Johnson, and Gregory W. Schmidt*

CORRECTIONS

1544 **Immunocytochemical Localization of Nitrite Reductase in Green Algae (Vol. 96: 669–704, 1991)**—Antonio López-Ruiz, Jean-Pierre Verbelen, Jose A. Bocanegra, and Jesús Diez*

1544 **Effects of Exogenous Auxins on Expression of Lipoxygenases in Cultured Soybean Embryos (Vol. 97: 969–976, 1991)**—Wennuan Liu, David F. Hildebrand, W. Scott Grayburn, Gregory C. Phillips, and Glenn B. Collins*

1544 **Utilization of Inorganic Carbon by *Ulva lactuca* (Vol. 97: 1439–1444, 1991)**—Zivia Drechsler and Sven Beer*

Volume Contents by Subject

METABOLISM AND ENZYMOLOGY

12 **Purification and Characterization of Cinnamyl Alcohol Dehydrogenase from Tobacco Stems**—Claire Halpin, Mary E. Knight, Jacqueline Grima-Pettenati, Deborah Goffner, Alain M. Boudet, and Wolfgang Schuch*

62 **Fungal Elicitor-Mediated Responses in Pine Cell Cultures. III. Purification and Characterization of Phenylalanine Ammonia-Lyase**—Malcolm M. Campbell and Brian E. Ellis*

71 **Cell Wall Dissolution in Ripening Kiwifruit (*Actinidia deliciosa*). Solubilization of the Pectic Polymers**—Robert J. Redgwell*, Laurence D. Melton, and Donald J. Brasch

82 **Purification and Molecular and Immunological Characterization of a Unique Phosphoribulokinase from the Green Alga *Selenastrum minutum***—Min Lin and David H. Turpin*

152 **Light Activation of Maize Phospho*enol*pyruvate Carboxylase Protein-Serine Kinase Activity Is Inhibited by Mesophyll and Bundle Sheath-Directed Photosynthesis Inhibitors**—Jin-an Jiao and Raymond Chollet*

174 **Purification and Partial Characterization of Maize (*Zea mays* L.) β-Glucosidase**—Asim Esen

215 **Solubilization, Partial Purification, and Immunodetection of Squalene Synthetase from Tobacco Cell Suspension Cultures**—Kathleen Hanley and Joseph Chappell*

287 **Sucrose Metabolism in Tubers of Potato (*Solanum tuberosum* L.). Effects of Sink Removal and Sucrose Flux on Sucrose-Degrading Enzymes**—H. A. Ross* and H. V. Davies

294 **Reduction of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase Content by Antisense RNA Reduces Photosynthesis in Transgenic Tobacco Plants**—Graham S. Hudson*, John R. Evans, Susanne von Caemmerer, Yvonne B. C. Arvidsson, and T. John Andrews

324 **Appearance of New Lipoxygenases in Soybean Cotyledons after Germination and Evidence for Expression of a Major New Lipoxygenase Gene**—Tomohiko Kato, Hiroyuki Ohta, Kunisuke Tanaka, and Daisuke Shibata*

331 **Purification and Properties of Glyoxysomal Cuprozinc Superoxide Dismutase from Watermelon Cotyledons (*Citrullus vulgaris* Schrad)**—Pablo Bueno and Luis A. del Río*

343 **Biosynthesis of Dehydrodiconiferyl Alcohol Glucosides: Implications for the Control of Tobacco Cell Growth**—John D. Orr and David G. Lynn*

392 **Occurrence of Temperature-Sensitive Phenotypic Plasticity in Chlorophyll-Deficient Mutants of *Arabidopsis thaliana***—John Markwell* and John C. Osterman

395 ***nit 7*: A New Locus for Molybdopterin Cofactor Biosynthesis in the Green Alga *Chlamydomonas reinhardtii***—Miguel R. Aguilar, Rafael Prieto, Jacobo Cárdenas, and Emilio Fernández*

402 **Antipeptide Antibodies That Can Distinguish Specific Subunit Polypeptides of Glutamine Synthetase from Bean (*Phaseolus vulgaris* L.)**—Xiaoyin Cai, Ralph L. Henry, Larry J. Takemoto, James A. Guikema, and Peter P. Wong*

406 **Nucleotide Sequence of the Photoregulated Maize Chloroplast *psa*I Gene, Encoding a 4.0-Kilodalton Component of Photosystem I**—Steven R. Rodermel* and Lawrence Bogorad

422 **Nitrate Reductase Regulates Expression of Nitrite Uptake and Nitrite Reductase Activities in *Chlamydomonas reinhardtii***—Aurora Galván, Jacobo Cárdenas, and Emilio Fernández*

427 **Herbicide Clomazone Does Not Inhibit *in Vitro* Geranylgeranyl Synthesis from Mevalonate**—Monte R. Weimer*, Nelson E. Balke, and Douglas D. Buhler

446 **Identification of Low Molecular Mass GTP-Binding Proteins in Membranes of the Halotolerant Alga *Dunaliella salina***—María P. Rodríguez-Rosales, David L. Herrin, and Guy A. Thompson, Jr.*

472 **Microheterogeneity in Purified Broad Bean Polyphenol Oxidase**—Chandrashekar Ganesa, Mary T. Fox, and William H. Flurkey*

480 **Contribution of Malate and Amino Acid Metabolism to Cytoplasmic pH Regulation in Hypoxic Maize Root Tips Studied Using Nuclear Magnetic Resonance Spectroscopy**—Justin K. M. Roberts*, Mark A. Hooks, Aaron P. Miaullis, Shaune Edwards, and Cecelia Webster

530 **Cellulase Occurs in Multiple Active Forms in Ripe Avocado Fruit Mesocarp**—Angelos K. Kanellis* and Panagiotis Kalaitzis

535 **Some Enzymes and Properties of the Reductive Carboxylic Acid Cycle Are Present in the Green Alga *Chlamydomonas reinhardtii* F-60**—Changguo Chen and Martin Gibbs*

546 **Photoaffinity Labeling of Mature and Precursor Forms of the Small Subunit of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase after Expression in *Escherichia coli***—Robert R. Klein* and Michael E. Salvucci

569 **Overproduction of γ-Linolenic and Eicosapentaenoic Acids by Algae**—Zvi Cohen*, Shoshana Didi, and Yair M. Heimer

573 **Decrease of Nitrate Reductase Activity in Spinach Leaves during a Light-Dark Transition**—Burgi Riens and Hans Walter Heldt*

578 **Carbon Oxysulfide Inhibition of the CO_2-Concentrating Process of Unicellular Green Algae**—Arun Goyal, Yoshihiro Shiraiwa, and N. Edward Tolbert*

602 **Metabolism of *ent*-Kaurene to Gibberellin A_{12}-Alde-**

* Author to whom correspondence should be addressed.

Continued on next page

hyde in Young Shoots of Normal Maize—Yoshihito Suzuki, Hisakazu Yamane, Clive R. Spray, Paul Gaskin, Jake MacMillan, and Bernard O. Phinney*

666 **Stromal pH and Photosynthesis Are Affected by Electroneutral K^+ and H^+ Exchange through Chloroplast Envelope Ion Channels**—Weihua Wu and Gerald A. Berkowitz*

708 **β-Furfuryl-β-Glucoside: An Endogenous Activator of Higher Plant UDP-Glucose:(1–3)-β-Glucan Synthase. Biological Activity, Distribution, and *in Vitro* Synthesis**—Patricia Ohana, Deborah P. Delmer, Gail Volman, John C. Steffens, David E. Matthews, and Moshe Benziman*

723 **Energy Requirements for Fatty Acid and Glycerolipid Biosynthesis from Acetate by Isolated Pea Root Plastids**—Kathryn F. Kleppinger-Sparace, Richard J. Stahl, and Salvatore A. Sparace*

764 **Simple Determination of the CO_2/O_2 Specificity of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase by the Specific Radioactivity of [^{14}C]Glycerate 3-Phosphate**—Genhai Zhu, Richard G. Jensen*, Richard B. Hallick, and Gunter F. Wildner

774 **Hysteresis and Cooperative Behavior of a Latent Plant Polyphenoloxidase**—Edelmira Valero and Francisco García-Carmona*

780 **Role of Cysteine in Activation and Allosteric Regulation of Maize Phospho*enol*pyruvate Carboxylase**—Thierry P. Chardot and Randolph T. Wedding*

801 **Dependence of Photosynthesis of Sunflower and Maize Leaves on Phosphate Supply, Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase Activity, and Ribulose-1,5-Bisphosphate Pool Size**—James Jacob* and David W. Lawlor

813 **Purification and Characterization of Dihydrodipicolinate Synthase from Pea**—Catherine Dereppe, Guido Bold, Oreste Ghisalba, Edith Ebert, and Hans-Peter Schär*

887 **Identification and Characterization of Glycolate Oxidase and Related Enzymes from the Endocyanotic Alga *Cyanophora paradoxa* and from Pea Leaves**—Thomas Betsche*, Dietmar Schaller, and Michael Melkonian

913 **Immunological Detection of Acetaldehyde-Protein Adducts in Ethanol-Treated Carrot Cells**—Pierdomenico Perata, Paolo Vernieri, Doretta Armellini, Massimo Bugnoli, Franco Tognoni, and Amedeo Alpi*

927 **Subcellular Distribution of *O*-Acetylserine(thiol)lyase in Cauliflower (*Brassica oleracea* L.) Inflorescence**—Norbert Rolland, Michel Droux, and Roland Douce*

949 **Leaf Photosynthesis and Respiration of High CO_2-Grown Tobacco Plants Selected for Survival under CO_2 Compensation Point Conditions**—Esteban Delgado, Joaquim Azcón-Bieto*, Xavier Aranda, Javier Palazón, and Hipólito Medrano

984 **Differential Carbon Monoxide Sensitivity of Cytochrome *c* Oxidase in the Leaves of C_3 and C_4 Plants**—Rajeev M. Naik*, Ashok R. Dhage, Shivaji V. Munjal, Prikshayat Singh, Babasaheb B. Desai, Shanti L. Mehta, and Manohar S. Naik

1020 **Proline Fed to Intact Soybean Plants Influences Acetylene Reducing Activity and Content and Metabolism of Proline in Bacteroids**—Yuxian Zhu, Georgia Shearer, and Daniel H. Kohl*

1098 **Endosperm Acidification and Related Metabolic Changes in the Developing Barley Grain**—Peter K. Macnicol* and John V. Jacobsen

1105 **Changes in Activities of Enzymes of Carbon Metabolism in Leaves during Exposure of Plants to Low Temperature**—A. Scott Holaday, Wayne Martindale, Rhu Alred, Andrew L. Brooks, and Richard C. Leegood*

1139 **Partial Purification and Characterization of Lysine-Ketoglutarate Reductase in Normal and Opaque-2 Maize Endosperms**—Marcia R. Brochetto-Braga, Adilson Leite, and Paulo Arruda*

1148 **Diacylglycerol Kinase from Suspension Cultured Plant Cells. Characterization and Subcellular Localization**—Josef B. Wissing and Karl G. Wagner*

1163 **Sucrose Synthase in Wild Tomato, *Lycopersicon chmielewskii*, and Tomato Fruit Sink Strength**—Jindong Sun, Tadeusz Loboda, Shi-Jean S. Sung, and Clanton C. Black, Jr.*

1170 **Posttranslational Modifications in the Amino-Terminal Region of the Large Subunit of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase from Several Plant Species**—Robert L. Houtz*, Loelle Poneleit, Samantha B. Jones, Malcolm Royer, and John T. Stults

1190 **Regulation of Glutamate Dehydrogenase Activity in Relation to Carbon Limitation and Protein Catabolism in Carrot Cell Suspension Cultures**—Sharon A. Robinson*, George R. Stewart, and Richard Phillips

1233 **Malate- and Pyruvate-Dependent Fatty Acid Synthesis in Leucoplasts from Developing Castor Endosperm**—Ronald G. Smith*, David A. Gauthier, David T. Dennis, and David H. Turpin

1264 **Purification and Properties of Putrescine Hydroxycinnamoyl Transferase from Tobacco (*Nicotiana tabacum*) Cell Suspensions**—Jonathan Negrel*, Michel Paynot, and Francine Javelle

1277 **Characterization and Subcellular Localization of Debranching Enzyme and Endoamylase from Leaves of Sugar Beet**—Bin Li, Jerome C. Servaites, and Donald R. Geiger*

1285 **Functional Importance of Arginine 64 in *Chlamydomonas reinhardtii* Phosphoribulokinase**—Keith R. Roesler, Beverly L. Marcotte, and William L. Ogren*

1290 **Interactions of Avocado (*Persea americana*) Cytochrome P-450 with Monoterpenoids**—David L. Hallahan*, Jonathan H. A. Nugent, Beverly J. Hallahan, Glenn W. Dawson, Diane W. Smiley, Jevon M. West, and Roger M. Wallsgrove

1317 **Purification, Characterization, and Immunological**

Properties of NADH-Dependent Glutamate Synthase from Rice Cell Cultures—Toshihiko Hayakawa, Tomoyuki Yamaya*, Kazunari Kamachi, and Kunihiko Ojima

1330 **Factors Affecting Expression of Enhanced Catalase Activity in a Tobacco Mutant with O_2-Resistant Photosynthesis**—Israel Zelitch

1364 **Purification, Characterization, and Cloning of Cinnamyl Alcohol Dehydrogenase in Loblolly Pine (*Pinus taeda* L.)**—David M. O'Malley*, Stephanie Porter, and Ronald R. Sederoff

1396 **Mannitol Synthesis in Higher Plants. Evidence for the Role and Characterization of a NADPH-Dependent Mannose 6-Phosphate Reductase**—Wayne H. Loescher*, R. Huw Tyson, John D. Everard, Robert J. Redgwell, and Roderick L. Bieleski

1429 **Theoretical Considerations when Estimating the Mesophyll Conductance to CO_2 Flux by Analysis of the Response of Photosynthesis to CO_2**—Peter C. Harley, Francesco Loreto, Giorgio Di Marco, and Thomas D. Sharkey*

1437 **Estimation of Mesophyll Conductance to CO_2 Flux by Three Different Methods**—Francesco Loreto, Peter C. Harley, Giorgio Di Marco, and Thomas D. Sharkey*

1460 **Sugar Concentrations in Guard Cells of *Vicia faba* Illuminated with Red or Blue Light. Analysis by High Performance Liquid Chromatography**—Matthew Poffenroth, David B. Green, and Gary Tallman*

1506 **Amino Acid Sequence and Molecular Weight of Native NADP Malate Dehydrogenase from the C_4 Plant *Zea mays***—Anthony Agostino, Peter Jeffrey, and Marshall D. Hatch*

1515 **Clomazone Does Not Inhibit the Conversion of Isopentenyl Pyrophosphate to Geranyl, Farnesyl, or Geranylgeranyl Pyrophosphate *in Vitro***—Rodney Croteau

MOLECULAR BIOLOGY AND GENE REGULATION

53 **Expression of a *Brassica napus* Malate Synthase Gene in Transgenic Tomato Plants during the Transition from Late Embryogeny to Germination**—Lucio Comai, Kelly L. Matsudaira, Rick C. Heupel, Robert A. Dietrich, and John J. Harada*

114 **Expression of Foreign Genes in Transgenic Yellow-Poplar Plants**—H. Dayton Wilde*, Richard B. Meagher, and Scott A. Merkle

163 **Complete Amino Acid Sequence of Soybean Leaf P21. Similarity to the Thaumatin-Like Polypeptides**—John S. Graham*, William Burkhart, Jin Xiong, and Jeffrey W. Gillikin

191 **Gibberellic Acid Regulates Chalcone Synthase Gene Transcription in the Corolla of *Petunia hybrida***—David Weiss*, Rik van Blokland, Jan M. Kooter, Joseph N. M. Mol, and Arjen J. van Tunen

206 **Expression of Constitutive and Tissue-Specific Acyl Carrier Protein Isoforms in *Arabidopsis***—Alenka Hlousek-Radojčić, Dusty Post-Beittenmiller, and John B. Ohlrogge*

380 **Phenylalanine Ammonia-Lyase from Loblolly Pine. Purification of the Enzyme and Isolation of Complementary DNA Clones**—Ross W. Whetten* and Ronald R. Sederoff

387 **5′-CATGCAT-3′ Elements Modulate the Expression of Glycinin Genes**—Jean-Marc Lelievre, Luiz O. Oliveira, and Niels C. Nielsen*

408 **Nucleotide Sequence of *S*-Adenosyl-L-Methionine: Magnesium Protoporphyrin Methyltransferase from *Rhodobacter capsulatus***—David W. Bollivar and Carl E. Bauer*

433 **Role of the Amino- and Carboxy-Terminal Regions in the Folding and Oligomerization of Wheat High Molecular Weight Glutenin Subunits**—Noam Shani, Jody D. Steffen-Campbell, Olin D. Anderson, Frank C. Greene, and Gad Galili*

458 **Expression of Maize Phospho*enol*pyruvate Carboxylase in Transgenic Tobacco. Effects on Biochemistry and Physiology**—Richard L. Hudspeth*, John W. Grula, Ziyu Dai, Gerald E. Edwards, and Maurice S. B. Ku

465 **Induction of 1-Aminocyclopropane-1-Carboxylate Synthase mRNA by Auxin in Mung Bean Hypocotyls and Cultured Apple Shoots**—Woo Taek Kim*, Aron Silverstone, Wing Kin Yip, Jian Guo Dong, and Shang Fa Yang

496 **Wounding Induces One of Two Isoenzymes of 3-Deoxy-D-*arabino*-Heptulosonate 7-Phosphate Synthase in *Solanum tuberosum* L.**—Gloria K. Muday and Klaus M. Herrmann*

525 **Evaluation of the Extent of Homologous Chloroplast DNA Sequences in the Mitochondrial Genome of Cowpea (*Vigna unguiculata* L.)**—Elena G. Orellano, Néstor Carrillo*, and Nora B. Calcaterra

554 **Ripening-Related Gene from Avocado Fruit. Ethylene-Inducible Expression of the mRNA and Polypeptide**—Douglas J. McGarvey, Reidun Sirevåg, and Rolf E. Christoffersen*

621 **Differential Expression of Histone H3 Gene Variants during Cell Cycle and Somatic Embryogenesis in Alfalfa**—Tamás Kapros*, László Bögre, Kinga Németh, László Bakó, János Györgyey, Sheng Cheng Wu, and Dénes Dudits

687 **Complementary DNA Cloning of Poplar Bark Storage Protein and Control of Its Expression by Photoperiod**—Gary D. Coleman*, Tony H. H. Chen, and Leslie H. Fuchigami

761 **Light and Fungal Elicitor Induce 3-Deoxy-D-*arabino*-Heptulosonate 7-Phosphate Synthase mRNA in Suspension Cultured Cells of Parsley (*Petroselinum crispum* L.)**—John M. Henstrand, Kent F. McCue, Kent Brink, Avtar K. Handa, Klaus M. Hermann, and Eric E. Conn*

790 **Cloning and Nucleotide Sequence of a Complementary DNA Encoding the Cytosolic Fructose-1,6-Bisphosphatase of Sugar Beet (*Beta vulgaris* L.)**—Chee Harn and Jaleh Daie*

792 **Nucleotide Sequence of a Soybean Vegetative Storage Protein *vspA* Gene**—Yoon Rhee and Paul E. Staswick*

794 **Nucleotide Sequence of a Soybean Vegetative Storage Protein *vspB* Gene**—Yoon Rhee and Paul E. Staswick*

796 **Nucleotide Sequence of a Complementary DNA Encoding *O*-Methyltransferase from Poplar**—Bernard Dumas, Jan Van Doorsselaere, Jan Gielen, Michel Legrand, Bernard Fritig, Marc Van Montagu*, and Dirk Inzé

798 **Molecular Analysis of the *psaC* Gene Encoding the F_A/F_B Apoprotein of Photosystem I in the Filamentous Cyanobacterium *Anabaena variabilis* ATCC 29413**—R. Mannar Mannan and Himadri B. Pakrasi*

808 **Photo and Nutritional Regulation of the Light-Harvesting Chlorophyll *a/b*-Binding Protein of Photosystem II mRNA Levels in *Euglena***—Ram Kishore and Steven D. Schwartzbach*

859 **Coregulation of Soybean Vegetative Storage Protein Gene Expression by Methyl Jasmonate and Soluble Sugars**—Hugh S. Mason*, Daryll B. DeWald, Robert A. Creelman, and John E. Mullet

868 **Aspartate Aminotransferase in Effective and Ineffective Alfalfa Nodules. Cloning of a cDNA and Determination of Enzyme Activity, Protein, and mRNA Levels**—J. Stephen Gantt, Ruby J. Larson, Mark W. Farnham, Sudam M. Pathirana, Susan S. Miller, and Carroll P. Vance*

1003 **Regulation of Phycobilisome Structure and Gene Expression by Light Intensity**—Robert M. de Lorimier, Russell L. Smith, and S. Edward Stevens, Jr.*

1050 **Physical Trauma and Tungsten Toxicity Reduce the Efficiency of Biolistic Transformation**—Julie A. Russell*, Mihir K. Roy, and John C. Sanford

1115 **Purification and Characterization of a 70-Kilodalton Polyadenylate-Binding Protein from Pea (*Pisum sativum*)**—Jianjun Yang and Arthur G. Hunt*

1154 **Characterization of the Expression of the Photosystem II-Oxygen Evolving Complex in C_4 Species of *Flaveria***—Susan L. Ketchner and Richard T. Sayre*

1214 **Genomic Nucleotide Sequence of a Wild-Type Shrunken-2 Allele of *Zea mays***—Janine R. Shaw and L. Curtis Hannah*

1255 **Transcriptional Regulation of Nitrate Reductase mRNA Levels by Cytokinin-Abscisic Acid Interactions in Etiolated Barley Leaves**—Jia-ling Lu, John R. Ertl, and Chong-maw Chen*

1261 **RNA Editing of Cytochrome Oxidase Subunit III in Sunflower Mitochondria**—Adolfo Saiardi and Carla Quagliariello*

1356 **Regulation of *Em* Gene Expression in Rice. Interaction between Osmotic Stress and Abscisic Acid**—Richard M. Bostock and Ralph S. Quatrano*

1409 **Translational Regulation of the Large and Small Subunits of Ribulose Bisphosphate Carboxylase/Oxygenase during Induction of the CO_2-Concentrating Mechanism in *Chlamydomonas reinhardtii***—Thomas L. Winder, James C. Anderson, and Martin H. Spalding*

1479 **Inhibition of Sucrose Enhancer Effect of the Potato Proteinase Inhibitor II Promoter by Salicylic Acid**—Seong-Ryong Kim, Younghee Kim, Michael A. Costa, and Gynheung An*

1518 **H-Protein of the Glycine Decarboxylase Multienzyme Complex. Complementary DNA Encoding the Protein from *Arabidopsis thaliana***—R. Srinivasan and David J. Oliver*

1520 **Nucleotide Sequences of cDNAs Encoding Two Members of the Brazil Nut Methionine-Rich 2S Albumin Gene Family**—Susan B. Altenbach*, Karen W. Pearson, and Samuel S. M. Sun

1526 **Isolation and Characterization of a Gene Encoding a Carboxypeptidase Y-Like Protein from *Arabidopsis thaliana***—Douglas Bradley

1530 **Sequence of a cDNA Coding for a 1-Aminocyclopropane-1-Carboxylate Oxidase Homolog from Apple Fruit**—Jian Guo Dong, David Olson, Aron Silverstone, and Shang Fa Yang*

1535 **Tomato Acid Phosphatase-1 Gene from a Nematode Resistant Cultivar**—Jack L. Erion*, Barbara Ballo, Tim W. Fox, and Lisa A. May

1538 **Barley (*Hordeum vulgare*) Gene for CP29, a Core Chlorophyll *a/b* Binding Protein of Photosystem II**—Annette B. Sørensen, Birgit F. Lauridsen, and Kirsten Gausing*

1541 **Nucleotide Sequence of the *psb*B Gene of *Chlamydomonas reinhardtii* Chloroplasts**—Sandra L. Berry-Lowe, Clayton H. Johnson, and Gregory W. Schmidt*

ENVIRONMENTAL AND STRESS PHYSIOLOGY

1 **Function of Photosynthetic Apparatus of Intact Wheat Leaves under High Light and Heat Stress and Its Relationship with Peroxidation of Thylakoid Lipids**—Ranjit K. Mishra and Gauri S. Singhal*

97 **Effects of Low O_2 Root Stress on Ethylene Biosynthesis in Tomato Plants (*Lycopersicon esculentum* Mill cv Heinz 1350)**—Tzann-Wei Wang and Richard N. Arteca*

108 **Solute Accumulation and Compartmentation during the Cold Acclimation of Puma Rye**—Karen L. Koster* and Daniel V. Lynch

127 **Heavy Metal-Activated Synthesis of Peptides in *Chlamydomonas reinhardtii***—Gregg Howe and Sabeeha Merchant*

137 **Enhanced Sensitivity to Ethylene in Nitrogen- or Phosphate-Starved Roots of *Zea mays* L. during Aerenchyma Formation**—Chuan-Jiu He, Page W. Morgan, and Malcolm C. Drew*

198 **An Improved Method for Using Electrolyte Leakage to Assess Membrane Competence in Plant Tissues**—Thomas H. Whitlow*, Nina L. Bassuk, Thomas G. Ranney, and Deborah L. Reichert

225 **Cadmium-Sulfide Crystallites in Cd-$(\gamma EC)_n$G Peptide Complexes from Tomato**—R. Neil Reese*, Cindy A. White, and Dennis R. Winge

230 **Aluminum Effects on Calcium Fluxes at the Root Apex of Aluminum-Tolerant and Aluminum-Sensitive Wheat Cultivars**—Jianwei W. Huang, Jon E. Shaff, David L. Grunes, and Leon V. Kochian*

316 **Diurnal Starch Accumulation and Utilization in Phosphorus-Deficient Soybean Plants**—Jinshu Qiu and Daniel W. Israel*

353 **Water Deficit Induces Abscisic Acid Accumulation in Endosperm of Maize *Viviparous* Mutants**—Eric S. Ober and Tim L. Setter*

411 **Effects of Anoxia on Mitochondrial Biogenesis in Rice Shoots. Modification of *in Organello* Translation Characteristics**—Ivan Couée*, Séverine Defontaine, Jean-Pierre Carde, and Alain Pradet

501 **Seasonal Variation in the Antioxidant System of Eastern White Pine Needles. Evidence for Thermal Dependence**—James V. Anderson, Boris I. Chevone*, and John L. Hess

516 **Regulation of Photosynthetic Rate of Two Sunflower Hybrids under Water Stress**—Carmen Gimenez, Valerie J. Mitchell, and David W. Lawlor*

540 **Stomatal Response to Abscisic Acid Is a Function of Current Plant Water Status**—François Tardieu* and William J. Davies

626 **Influence of NaCl on Growth, Proline, and Phosphoenolpyruvate Carboxylase Levels in *Mesembryanthemum crystallinum* Suspension Cultures**—John C. Thomas*, Richard L. De Armond, and Hans J. Bohnert

632 **Mechanism of Aluminum Inhibition of Net $^{45}Ca^{2+}$ Uptake by *Amaranthus* Protoplasts**—Zdenko Rengel* and Daphne C. Elliott

639 **Differential Inhibition by Ferulic Acid of Nitrate and Ammonium Uptake in *Zea mays* L.**—Christine L. Bergmark, William A. Jackson*, Richard J. Volk, and Udo Blum

660 **Heterogenous Stomatal Closure in Response to Leaf Water Deficits Is Not a Universal Phenomenon**—Dhammika Gunasekera and Gerald A. Berkowitz*

700 **Changes in the Polypeptide Patterns of Barley Seedlings Exposed to Jasmonic Acid and Salinity**—Liliana Todorova Maslenkova, Tania Simeonova Miteva, and Losanka P. Popova*

716 **Variability in Proline-Accumulating Ability of Barley (*Hordeum vulgare* L.) Cultivars Induced by Vapor Pressure Deficit**—Bodapati P. Naidu, Donald Aspinall, and Leslie G. Paleg*

738 **Oxidation and Reduction of Sulfite by Chloroplasts and Formation of Sulfite Addition Compounds**—Andreas P. M. Dittrich, Hardy Pfanz, and Ulrich Heber*

745 **Abscisic Acid Increases Terrestrial Plant Cell Resistance to Hydrostatic Pressure**—Karen K. Tanino*, Tony H. H. Chen, Leslie H. Fuchigami, and Conrad J. Weiser

749 **Low Measuring Temperature Induced Artifactual Increase in Chlorophyll *a* Fluorescence**—Norman P. A. Huner, Gunnar Öquist*, and Lars-Göran Sundblad

757 **CO_2 Inhibits Respiration in Leaves of *Rumex crispus* L.**—Jeffrey S. Amthor*, George W. Koch, and Arnold J. Bloom

769 **Behavior of Etiolated Peas (*Pisum sativum* cv Alaska) When Obstructed by a Mechanical Barrier**—David A. Schwarzbach, Ernst J. Woltering, and Mikal E. Saltveit*

853 **Glutathione Depletion Due to Copper-Induced Phytochelatin Synthesis Causes Oxidative Stress in *Silene cucubalus***—C. H. Ric De Vos*, Marjolein J. Vonk, Riet Vooijs, and Henk Schat

879 **Circadian Rhythms of Chemotaxis to Ammonium and of Methylammonium Uptake in *Chlamydomonas***—Thomas Edward Byrne, Marion Robert Wells, and Carl Hirschie Johnson*

908 **Bound Water in Durum Wheat under Drought Stress**—Agata Rascio*, Cristiano Platani, Natale Di Fonzo, and Giovanni Wittmer

966 **Alteration of Components of Leaf Water Potential and Water Content in Velvetleaf under the Effects of Long-Term Humidity Difference**—Yao-Hua Luo* and Boyd R. Strain

995 **Regulation of Expression of Proteinase Inhibitor Genes by Methyl Jasmonate and Jasmonic Acid**—Edward E. Farmer, Russell R. Johnson, and Clarence A. Ryan*

1057 **Quantitative Models Characterizing Seed Germination Responses to Abscisic Acid and Osmoticum**—Bing-Rui Ni and Kent J. Bradford*

1069 **Regulation of Photosynthesis in Triazine-Resistant and -Susceptible *Brassica napus***—Jack H. Dekker* and Thomas D. Sharkey

1128 **Phosphorus Nutrition Influence on Leaf Senescence in Soybean**—Steven J. Crafts-Brandner

1133 **Phosphorus Nutrition Influence on Starch and Sucrose Accumulation, and Activities of ADP-Glucose Pyrophosphorylase and Sucrose-Phosphate Synthase during the Grain Filling Period in Soybean**—Steven J. Crafts-Brandner

1175 **Relationships among Isoprene Emission Rate, Photosynthesis, and Isoprene Synthase Activity as Influenced by Temperature**—Russell K. Monson*, Charles H. Jaeger, William W. Adams III, Edward M. Driggers, Gary M. Silver, and Ray Fall

1207 **Changes in Soluble Carbohydrates during Seed Storage**—Irma Bernal-Lugo and A. Carl Leopold*

1222 **Magnesium Deficiency and High Light Intensity Enhance Activities of Superoxide Dismutase, Ascorbate Peroxidase, and Glutathione Reductase in Bean Leaves**—Ismail Cakmak and Horst Marschner*

1228 **Effects of Abscisic Acid Treatment on the Thermostability of the Photosynthetic Apparatus in Barley Chloroplasts**—Alexander G. Ivanov, Maia I. Kitcheva, Alexander M. Christov, and Losanka P. Popova*

1310 **Internal CO_2 Measured Directly in Leaves. Abscisic Acid and Low Leaf Water Potential Cause Opposing Effects**—Michael J. Lauer* and John S. Boyer

1342 **Metabolism of 1-Aminocycloproprane-1-Carboxylic Acid in Etiolated Maize Seedlings Grown under**

Mechanical Impedance—Jorge I. Sarquis, Page W. Morgan*, and Wayne R. Jordan

1372 **Inhibition of Violaxanthin Deepoxidation by Ultraviolet-B Radiation in Isolated Chloroplasts and Intact Leaves**—Erhard E. Pfündel*, Run-Sun Pan, and Richard A. Dilley

1403 **Effects of Nitrate and Ammonium on Gene Expression of Phospho*enol*pyruvate Carboxylase and Nitrogen Metabolism in Maize Leaf Tissue during Recovery from Nitrogen Stress**—Bambang Sugiharto and Tatsuo Sugiyama*

1472 **Phosphate-Regulated Induction of Intracellular Ribonucleases in Cultured Tomato (*Lycopersicon esculentum*) Cells**—Andreas Löffler, Steffen Abel, Wolfgang Jost, Jaap J. Beintema, and Konrad Glund*

1523 **Sequences of the Cotton Group 2 LEA/RAB/Dehydrin Proteins Encoded by *Lea3* cDNAs**—Glenn A. Galau* and Timothy J. Close

1532 **Complementary DNA Sequence of a Low Temperature-Induced *Brassica napus* Gene with Homology to the *Arabidopsis thaliana kin1* Gene**—Winson Orr*, Betty Iu, Theresa C. White, Laurian S. Robert, and Jas Singh

DEVELOPMENT AND GROWTH REGULATION

89 **Growth Stimulation by Catecholamines in Plant Tissue/Organ Cultures**—Calixto M. Protacio, Yao-ren Dai, Eldrin F. Lewis, and Hector E. Flores*

101 **Auxin Transport and the Interaction of Phytotropins. Probing the Properties of a Phytotropin Binding Protein**—Sandra A. Brunn, Gloria K. Muday, and Philip Haworth*

157 **Differential Protein Accumulation in Banana Fruit during Ripening**—Eva Dominguez-Puigjaner, Miguel Vendrell*, and M. Dolors Ludevid

166 **Rejuvenation of *Sequoia sempervirens* by Repeated Grafting of Shoot Tips onto Juvenile Rootstocks *in Vitro*. Model for Phase Reversal of Trees**—Li-Chun Huang, Suwenza Lius, Bau-Lian Huang, Toshio Murashige*, El Fatih M. Mahdi, and Richard Van Gundy

246 **Stimulation of Root Elongation and Curvature by Calcium**—Hideyuki Takahashi*, Tom K. Scott, and Hiroshi Suge

309 **Nitrate-Regulated Growth and Cytokinin Responses in Seminal Roots of Barley**—Mariann E. Samuelson*, Lennart Eliasson, and Carl-Magnus Larsson

337 **Immunological Evidence of Thaumatin-Like Proteins during Tobacco Floral Differentiation**—Luc Richard*, Montserrat Arró, Johan Hoebeke, D. Ry Meeks-Wagner, and Kiem Tran Thanh Van

369 **Changes in Molecular Size of Previously Deposited and Newly Synthesized Pea Cell Wall Matrix Polysaccharides. Effects of Auxin and Turgor**—Lawrence D. Talbott and Peter M. Ray*

399 **Mannosyl- and Xylosyl-Containing Glycans Promote Tomato (*Lycopersicon esculentum* Mill.) Fruit Ripening**—Bernard Priem and Kenneth C. Gross*

488 **Auxin and Growth Regulation of Rice Coleoptile Segments. Molecular Analysis**—Diego Breviario*, Silvia Gianì, Paolo Di Vietri, and Immacolata Coraggio

509 **Distribution of Napin and Cruciferin in Developing Rape Seed Embryos**—Anna-Stina Höglund*, Joakim Rödin, Erik Larsson, and Lars Rask

694 **Photosynthesis and Photorespiration in Presenescent, Senescent, and Rejuvenated Soybean Cotyledons**—Laura Fredrick Marek* and Cecil R. Stewart

753 **High Performance Liquid Chromatography Analysis of Carbohydrates of Cotton-Phloem Sap and of Honeydew Produced by *Bemisia tabaci* Feeding on Cotton**—Mitchell C. Tarczynski*, David N. Byrne, and William B. Miller

822 **Gametic Differentiation of *Chlamydomonas reinhardtii*. Control by Nitrogen and Light**—Christoph F. Beck* and Axel Acker

835 **Light Regulation of the Growth Response in Corn Root Gravitropism**—Maureen O. Kelly and A. Carl Leopold*

840 **Gradients of Turgor, Osmotic Pressure, and Water Potential in the Cortex of the Hypocotyl of Growing *Ricinus* Seedlings. Effects of the Supply of Water from the Xylem and of Solutes from the Phloem**—Anatoli Meshcheryakov, Ernst Steudle*, and Ewald Komor

955 **Identification and Kinetics of Accumulation of Proteins Induced by Ethylene in Bean Abscission Zones**—Elena del Campillo* and Lowell N. Lewis

962 **Nondwarf Rice Seedling Bioassay for Gibberellins**—Takaaki Nishijima*, Masaji Koshioka, and Hiroko Yamaji

1011 **Differential Synthesis of Photosystem Cores and Light-Harvesting Antenna during Proplastid to Chloroplast Development in *Spirodela oligorrhiza***—Dennis J. McCormac and Bruce M. Greenberg*

1029 **Some Properties of a Functional Reconstituted Plasmalemma H^+-ATPase Activated by Fusicoccin**—Mauro Marra, Alessandro Ballio, Maria Rosaria Fullone, and Patrizia Aducci*

1035 **Comparison of Benzyl Adenine Metabolism in Two *Petunia hybrida* Lines Differing in Shoot Organogenesis**—Carol A. Auer*, Jerry D. Cohen, Michel Laloue, and Todd J. Cooke

1042 **Physiological Changes Accompanying Senescence in the Ephemeral Daylily Flower**—Roderick L. Bieleski* and Michael S. Reid

1121 **Modification by Ethylene of the Cell Growth Pattern in Different Tissues of Etiolated Lupine Hypocotyls**—José Sánchez-Bravo*, Ana M. Ortuño, Manuela Pérez-Gilabert, Manuel Acosta, and Francisco Sabater

1298 **Comparison of the Outer and Inner Epidermis. Inhibition of Auxin-Induced Elongation of Maize Coleoptiles by Glucan Antibodies**—Takayuki Hoson, Yoshio Masuda, and Donald J. Nevins*

1323 **Changes in Cytosolic Glutamine Synthetase Polypep-**

tide and its mRNA in a Leaf Blade of Rice Plants during Natural Senescence—Kazunari Kamachi, Tomoyuki Yamaya*, Toshihiko Hayakawa, Tadahiko Mae, and Kunihiko Ojima

1336 Cell Wall Free Space of *Cucumis* Hypocotyls Contains NAD and a Blue Light-Regulated Peroxidase Activity—James R. Shinkle*, Steven J. Swoap, Patrice Simon, and Russell L. Jones

1381 Phase Shift in Leaf Movements of *Xanthium* Attributed to Age and Rhythm Patterns—Willard L. Koukkari, LeAnne Carlson Hobbs, and Frank B. Salisbury*

1386 *In Situ* Abscisic Acid Synthesis. A Requirement for Induction of Embryo Dormancy in *Helianthus annuus*—Marie-Thérèse Le Page-Degivry* and Ginette Garello

1391 Abscisic Acid and the Maturation of Cacao Embryos *in Vitro*—Valerie Creaser Pence

1423 Development of the Potential for Cyanogenesis in Maturing Black Cherry (*Prunus serotina* Ehrh.) Fruits—Elisabeth Swain, Chung Ping Li, and Jonathan E. Poulton*

1444 Protein Differences between Two Isogenic Cultivars of Barley (*Hordeum vulgare* L.) that Differ in Sensitivity to Photoperiod and Far-Red Light—Jan M. Principe, William R. Hruschka, Brian Thomas, and Gerald F. Deitzer*

1484 Role of Abscisic Acid in the Induction of Desiccation Tolerance in Developing Seeds of *Arabidopsis thaliana*—Cor Meurs, Amarjit S. Basra, Cees M. Karssen, and Leendert C. van Loon*

CELLULAR AND STRUCTURAL BIOLOGY

24 Immunochemical Analysis of the Temporal and Tissue-Specific Expression of an *Avena sativa* Plasma Membrane Determinant—Michael A. Lynes

183 Sidedness of Plant Plasma Membrane Vesicles Altered by Conditions of Preparation—Andrew O. Brightman and D. James Morré*

253 The Shibata Shift and the Transformation of Etioplasts to Chloroplasts in Wheat with Clomazone (FMC 57020) and Amiprophos-Methyl (Tokunol M)—Nancy N. Artus, Margareta Ryberg*, Agneta Lindsten, Hans Ryberg, and Christer Sundqvist

264 Arabinogalactan-Rich Glycoproteins Are Localized on the Cell Surface and in Intravacuolar Multivesicular Bodies—Eliot M. Herman* and Christopher J. Lamb

273 Variation of the Polypeptide Composition of Mitochondria Isolated from Different Potato Tissues—Catherine Colas des Francs-Small*, Françoise Ambard-Bretteville, Anny Darpas, Marc Sallantin, Jean-Claude Huet, Jean-Claude Pernollet, and René Rémy

357 Molecular Size and Separability Features of Pea Cell Wall Polysaccharides. Implications for Models of Primary Wall Structure—Lawrence D. Talbott and Peter M. Ray*

595 Processing of the Precursors for the Light-Harvesting Chlorophyll-Binding Proteins of Photosystem II and Photosystem I during Import and in an Organelle-Free Assay—Steven E. Clark and Gayle K. Lamppa*

646 Changes in Esterification of the Uronic Acid Groups of Cell Wall Polysaccharides during Elongation of Maize Coleoptiles—Jong-Bum Kim and Nicholas C. Carpita*

673 Characterization of Parameters Influencing Receptor-Mediated Endocytosis in Cultured Soybean Cells—Mark A. Horn, Peter F. Heinstein, and Philip S. Low*

919 A Repetitive Proline-Rich Protein from the Gymnosperm Douglas Fir Is a Hydroxyproline-Rich Glycoprotein—Marcia Kieliszewski*, Renate de Zacks, Joseph F. Leykam, and Derek T. A. Lamport

1080 α-Amylase Isoforms are Posttranslationally Modified in the Endomembrane System of the Barley Aleurone Layer—Liliane Sticher and Russell L. Jones*

MICROBE-PLANT INTERACTIONS

121 Covalent Binding Sites of Victorin in Oat Leaf Tissues Detected by Anti-Victorin Polyclonal Antibodies—Kazuya Akimitsu, L. Patrick Hart*, Jonathan D. Walton, and Rawle Hollingsworth

143 Nodules Initiated by *Rhizobium meliloti* Exopolysaccharide Mutants Lack a Discrete, Persistent Nodule Meristem—Cheng Yang, Ethan R. Signer, and Ann M. Hirsch*

221 Gibberellins and the Legume-*Rhizobium* Symbiosis. I. Endogenous Gibberellins of Lima Bean (*Phaseolus lunatus* L.) Stems and Nodules—Raymond C. Dobert, Stewart B. Rood, and Dale G. Blevins*

303 Isolation, Purification, and Identification of 2-(*p*-Hydroxyphenoxy)-5,7-Dihydroxychromone: A Fungal-Induced Phytoalexin from *Cassia obtusifolia*—Amir Sharon, Rodolfo Ghirlando, and Jonathan Gressel*

584 Regulation of Nodule Glutamine Synthetase by CO_2 Levels in Bean (*Phaseolus vulgaris* L.)—José-Luis Ortega, Federico Sánchez, Mario Soberón, and Miguel Lara Flores*

654 Glyphosate Suppression of an Elicited Defense Response. Increased Susceptibility of *Cassia obtusifolia* to a Mycoherbicide—Amir Sharon, Ziva Amsellem, and Jonathan Gressel*

680 Effect of Elicitation and Changes in Extracellular pH on the Cytoplasmic and Vacuolar pH of Suspension-Cultured Soybean Cells—Mark A. Horn, Robert P. Meadows, Izydor Apostol, Claude R. Jones, David G. Gorenstein, Peter F. Heinstein, and Philip S. Low*

728 Rapid Activation of Phenylpropanoid Metabolism in Elicitor-Treated Hybrid Poplar (*Populus trichocarpa* Torr. & Gray × *Populus deltoides* Marsh) Suspension-Cultured Cells—Mário Moniz de Sá, Rajgopal Subramaniam, Frank E. Williams, and Carl J. Douglas*

777 **Induction of Pseudoactinorhizae by the Plant Pathogen *Agrobacterium rhizogenes*—**R. Howard Berg, Lixia Liu, Jeffrey O. Dawson*, Michael A. Savka, and Stephen K. Farrand

784 **Mannityl Opine Accumulation and Exudation of Transgenic Tobacco—**Michael A. Savka* and Stephen K. Farrand

894 **Nitrogenase Activity, Nodule Respiration, and O_2 Permeability Following Detopping of Alfalfa and Birdsfoot Trefoil—**R. Ford Denison*, Stephen Hunt, and David B. Layzell

901 **Mathematical Modeling of Oxygen Diffusion and Respiration in Legume Root Nodules—**R. Ford Denison

936 **Biosynthesis and Secretion of Cryptogein, a Protein Elicitor Secreted by *Phytophthora cryptogea*—**Thérèse Tercé-Laforgue*, Jean-Claude Huet, and Jean-Claude Pernollet

942 **Urease-Null and Hydrogenase-Null Phenotypes of a Phylloplane Bacterium Reveal Altered Nickel Metabolism in Two Soybean Mutants—**Mark A. Holland* and Joseph C. Polacco

979 **Hormone-Resistant Mutants of *Arabidopsis* Have an Attenuated Response to *Agrobacterium* Strains—**Cynthia Lincoln, Joceyln Turner, and Mark Estelle*

1074 **Characterization of δ-Aminolevulinic Acid Formation in Soybean Root Nodules—**Indu Sangwan and Mark R. O'Brian*

1181 **Growth and Movement of Spot Inoculated *Rhizobium meliloti* on the Root Surface of Alfalfa—**Gustavo Caetano-Anollés, Elizabeth Wrobel-Boerner, and Wolfgang D. Bauer*

1217 **Oxidation and Reduction of Leghemoglobin in Root Nodules of Leguminous Plants—**Manuel Becana* and Robert V. Klucas

1239 **Glycopeptide Elicitors of Stress Responses in Tomato Cells. *N*-Linked Glycans Are Essential for Activity but Act as Suppressors of the Same Activity when Released from the Glycopeptides—**Christoph W. Basse and Thomas Boller*

1304 **Phytoalexin Accumulation in *Arabidopsis thaliana* during the Hypersensitive Reaction to *Pseudomonas syringae* pv *syringae*—**Jun Tsuji, Evelyn P. Jackson, Douglas A. Gage, Raymond Hammerschmidt, and Shauna C. Somerville*

1451 **Factors Affecting the Acetylene-Induced Decline during Nitrogenase Assays in Root Nodules of *Myrica gale* L.—**John D. Tjepkema* and Christa R. Schwintzer

1502 **Pathogenesis-Related Proteins and Polyamines in a Developmental Mutant of Tomato, *Epinastic*—**José M. Bellés, Pablo Tornero, and Vicente Conejero*

MEMBRANES AND BIOENERGETICS

7 **Involvement of Singlet Oxygen in 5-Aminolevulinic Acid-Induced Photodynamic Damage of Cucumber (*Cucumis sativus* L.) Chloroplasts—**Niranjan Chakraborty and Baishnab Charan Tripathy*

17 **Selective Inhibition of Active Uptake of Sucrose into Plasma Membrane Vesicles by Polyclonal Sera Directed against a 42 Kilodalton Plasma Membrane Polypeptide—**Olivier Gallet, Rémi Lemoine, Cécile Gaillard, Christer Larsson, and Serge Delrot*

34 **Redox Processes in the Blue Light Response of Guard Cell Protoplasts of *Commelina communis* L.—**Hélène Gautier*, Alain Vavasseur, Gérard Lascève, and Alain M. Boudet

39 **Biochemical Characteristics of Thylakoid Membranes in Chloroplasts of Dark-Grown Pine Cotyledons—**Kenji Shinohara*, Akio Murakami, and Yoshihiko Fujita

44 **Inhibition of Tonoplast ATPase by 2′,3′-Dialdehyde Derivative of ATP—**Wing Ming Chow, Chi Meng Tzeng, Chung Shung Chen, Soong Yu Kuo, May Yun Wang, and Rong Long Pan*

238 **Identification and Analysis of a Barley cDNA Clone Encoding the 31-Kilodalton LHC IIa (CP29) Apoprotein of the Light-Harvesting Antenna Complex of Photosystem II—**Daryl T. Morishige and J. Philip Thornber*

279 **Flow Cytometric Analysis of Rhodamine 123 Fluorescence during Modulation of the Membrane Potential in Plant Mitochondria—**Patrice X. Petit

442 **Transport of Stachyose and Sucrose by Vacuoles of Japanese Artichoke (*Stachys sieboldii*) Tubers—**Felix Keller

452 **Calcium Transport by Corn Mitochondria. Evaluation of the Role of Phosphate—**Marco Aurelio P. Silva, Eva G. S. Carnieri, and Anibal E. Vercesi*

560 **Na^+-Independent HCO_3^- Transport and Accumulation in the Cyanobacterium *Synechococcus* UTEX 625—**George S. Espie* and Ramani A. Kandasamy

588 **Partial Purification and Characterization of Complex I, NADH:Ubiquinone Reductase, from the Inner Membrane of Beetroot Mitochondria—**Kathleen L. Soole, Ian B. Dry, and Joseph T. Wiskich*

611 **Transport Kinetics and Metabolism of Exogenously Applied Putrescine in Roots of Intact Maize Seedlings—**Joseph M. DiTomaso*, Jonathan J. Hart, and Leon V. Kochian

827 **Comparison of Developmental Gradients for Growth, ATPase, and Fusicoccin-Binding Activity in Mung Bean Hypocotyls—**Leslie E. Basel* and Robert E. Cleland

971 **Identification and Characterization of Lipoxygenase Isoforms in Senescing Carnation Petals—**Marie-Aude Rouet-Mayer, Jean-Marc Bureau, and Christiane Laurière*

988 **Relationship between Electron Transport across the Plasmalemma and a pH Decrease in the Bulk Medium—**Bernard Rubinstein*, Arthur I. Stern, and Jonathan D. C. Chalmers

1087 **K^+ Channels Are Responsible for an Inwardly Rectify-**

ing Current in the Plasma Membrane of Mesophyll Protoplasts of *Avena sativa*—Joseph Kourie and Mary Helen M. Goldsmith*

1196 **Plasma Membrane Ca-ATPase of Radish Seedlings. I. Biochemical Characterization Using ITP as a Substrate—**Antonella Carnelli, Maria I. De Michelis, and Franca Rasi-Caldogno*

1202 **Plasma Membrane Ca-ATPase of Radish Seedlings. II. Regulation by Calmodulin—**Franca Rasi-Caldogno*, Antonella Carnelli, and Maria I. De Michelis

1211 **Novel Light-Regulated Chloroplast Thylakoid Membrane Protein—**Kent O. Burkey

1248 **Characterization of the Major Integral Protein of Vacuolar Membrane—**Masayoshi Maeshima

1270 **Ethrel (Ethylene Releaser)-Induced Increases in the Adenylate Pool and Transtonoplast ΔpH within *Hevea* Latex Cells—**Zakia Amalou, Jacques Bangratz, and Hervé Chrestin*

1349 **Synergistic Effect of Light and Fusicoccin on Stomatal Opening. Epidermal Peel and Patch Clamp Experiments—**Sarah M. Assmann* and Amnon Schwartz

1415 **Effect of Diclofop on the Membrane Potentials of Herbicide-Resistant and -Susceptible Annual Ryegrass Root Tips—**Richard H. Shimabukuro* and Barry L. Hoffer

1494 **Two Types of Channels Involved in the Malate Ion Transport across the Tonoplast of a Crassulacean Acid Metabolism Plant—**Ikuko Iwasaki*, Hiroyuki Arata, Hiromasa Kijima, and Mitsuo Nishimura

1511 **Phytochrome Activation of K^+ Channels and Chloroplast Rotation in *Mougeotia*. Action Spectra—**Roger R. Lew*, Flora Krasnoshtein, Bruce S. Serlin, and Charles L. Schauf

NATURAL PRODUCTS

1498 **Evidence of Two Isomers of Phosphatidylinositol in Plant Tissue—**Pushpalatha P. N. Murthy*, Gay Pliska-Matyshak, Lisa M. Keranen, Philippe Lam, Hans H. Mueller, and N. Bhuvarahamurthy